RAILROAD GAZETTE

SATURDAY, MARCH 8, 1873.

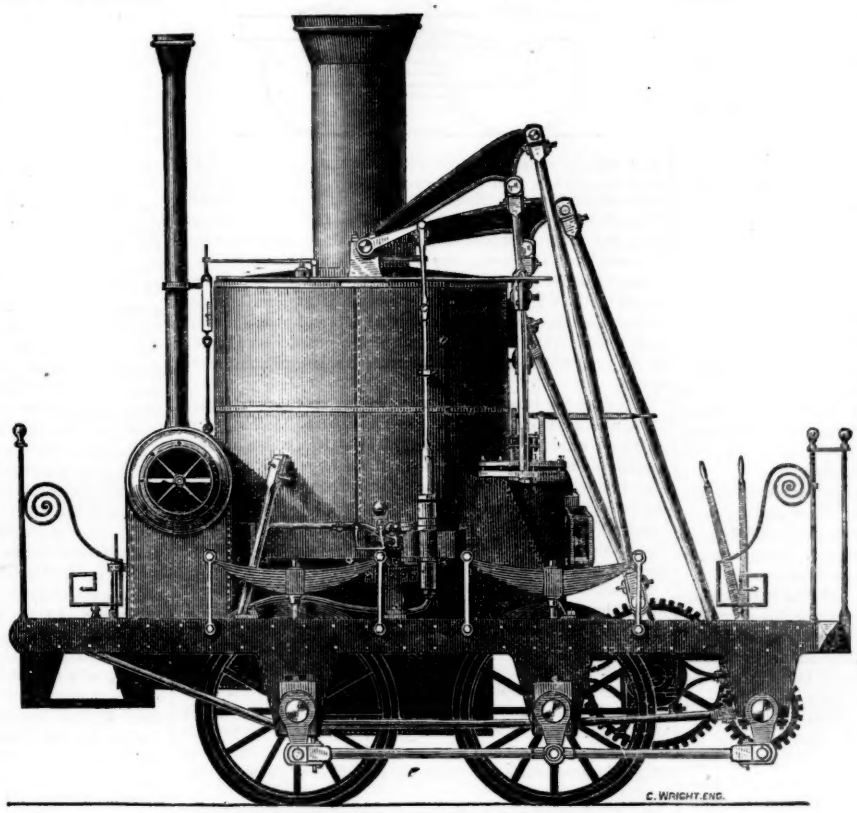
Contributions.

The President of the Railway Association of America.

The Hon. Thomas Allen, M. A., who has lately been elected President of the Railway Association of America, is one of those of whom it has been said "They make history, and their works are their best monuments." Mr. Allen, whose later years have been devoted to the West, is of Eastern origin. He comes of a family long known in Massachusetts history. Old associations have yet the power to withdraw him yearly from the excitement of active life to his ancestral home at Pittsfield, Mass., where he spends a part of every summer.

Entering Union College in 1829, he graduated in 1832, when he commenced the study of law at Albany. His studies were interrupted by the approach of cholera to that city in its first fearful visitation to America, and before they could be resumed, family misfortunes involving loss of means had rendered it necessary for him to begin active life. With a good education, a fine physique, and a kind father's blessing, and *twenty-five* dollars as capital stock, Mr. Allen, on the 18th of October, 1832, took lodgings in a house at the corner of Wall street and Broadway, New York. In a few days he secured a clerkship in the law office of Messrs. Cambreling & Hitch, at a salary of $300 per annum. Here, for three years, he was enabled to study law and to increase his little income by copying for lawyers and writing for the press. At one time he was making arrangements with a bookseller to start the first penny paper ever published in America, but others, with more capital, hearing of the design, took the wind out of his sails and drove him to pursue other courses. In September, 1834, he became editor of the *Family Magazine*, which he continued to manage for a year and a half, in such spare moments as his duties and legal studies permitted. He was then engaged by the principal law-bookselling house of New York to compile a digest of decisions of the New York courts from the earliest times down to that period, which work he labored at for over a year, and "The Digest," published and republished, was long a standard work. In 1835, at the age of twenty-one, he was admitted to the bar by the New York Supreme Court, received the master's degree from his Alma Mater, and was elected an honorary member of the "Phi Beta Kappa"—an honor not often lightly bestowed. In 1836, in his native town, he took a prominent part on behalf of Mr. Van Buren during the Presidential election. During the excited short session at the close of General Jackson's last administration, Mr. Allen resided at Washington with his uncle, General E. W. Ripley, then Representative in Congress from Louisiana, and was much in the society of the President and the distinguished statesmen of that day, such as Daniel Webster and John Quincy Adams. The spring of 1837 discovered Mr. Allen at Washington, editor of the *Madisonian*, advocating the policy that a mixed currency is essential to a highly civilized commercial state. The success of the *Madisonian* is a matter of history, on which it is not necessary now to dwell. After a hard contest of three days, Mr. Allen was elected public printer, defeating Gales & Seaton, of the *Intelligencer*, and Blair & Rives, of the *Globe*. Weary of the ceaseless strife of politics, he removed to St. Louis in the spring of 1842, and began to devote his talents to public interests with abilities and zeal which have produced great results for himself, as well as for the city and State of his adoption. Shortly after his arrival, he was elected President of the Horticultural Society. After the lapse of a few years, devoted to study of the physical geography and resources of the Mississippi Valley, he in 1847 prepared a pamphlet upon the commerce and navigation of that river, which showed his mastery of the subject. At one period in his youth it happened that the matter of paramount importance in his native town was the construction through it of the Western Railroad of Massachusetts. In the discussions regarding it, the young student had acquired an interest in internal improvements which deepened as his observation widened, and he was now eager to extend the benefit of the railroad to his adopted State. St. Louis was not then the bold, ambitious, public-spirited city she now claims to be, and the man who attempted to awaken her slumbering citizens might well have been disgusted at the supineness and stolid indifference that met him at every hand. Mr. Allen, as a writer, as a public speaker and persuasive conversationalist, as well as by his fullness of information and buoyant energy, was well fitted for such an undertaking. At that time (1848) in the whole of the United States there were but 7,000 miles of railroad, not a mile of it west of the Mississippi. In that year Mr. Allen issued an address to the voters of St. Louis in behalf of a subscription to the "St. Louis & Cincinnati Railroad," and the next year actively supported Senator Benton in his scheme for a line to the Pacific coast. At a large meeting held at St. Louis, Feb. 20, Mr. Allen was called upon to take action on the subject. He reported resolutions strongly in favor of a national highway to the Pacific, which were passed and received a hearty response from the State Legislature. In the October following he issued a call for a convention, in response to which delegates from fourteen States assembled. The convention intrusted him with the preparation of an address to the people of the United States and a memorial to Congress in favor of assistance to railroads.

Charters for roads were granted from time to time, but the companies very rarely took the trouble to organize. In this way one had been granted, but lay idle, for a Pacific railroad. Mr. Allen took hold of this, and in January, 1850, began to organize the company, of which he was elected President. In the same year he was chosen for four years to the Senate of Missouri, where he was immediately made Chairman of the Committee on Internal Improvements. He obtained for the Pacific Railroad a loan of State credit to the extent of $2,000,000. Traveling on horseback along the proposed route, he roused the dormant energies of the people by spirited



*THE BALTIMORE AND OHIO LOCOMOTIVE ENGINE, as Manufactured by Gillingham & Winans.**

nomination offered him. In 1857, he was chosen President of the Terre Haute, Alton & St. Louis Railroad Company, but, harangues, and having procured a number of petitions to Congress asking for a grant of land to aid the road, he posted off to Washington, where his perseverance was rewarded by an act, passed in June, 1852, granting alternate sections of land—the first encouragement given by Congress to a Pacific railroad. In September of the same year, Mr. Allen in the State Senate proposed the plan of a system of railroads that would embrace the interests, promote the prosperity and insure the cordial co-operation of all parts of the State. The system comprised the following lines:

The Missouri Pacific, with a State loan of $3,000,000 and an assignment of 1,250,000 acres of the national land grant; the Southwestern Branch, with a loan of $1,000,000; Iron Mountain, with a loan of $750,000; Hannibal & St. Joseph, with a loan of $1,500,000 and a land grant of 600,000 acres; North Missouri, with $2,000,000 loan. This plan the Legislature was not then prepared to accept as a whole, but it was within four months from that time carried out by the incorporation of companies to construct the lines and the loan of the State credit to each, except the Southwestern Branch.

In 1854, 38 miles of the Pacific were in operation and over 100 more under construction. Mr. Allen resigned his position as President, and also retired from the Senate, declining the re-

finding it deeply involved in debt, he withdrew at the end of a year and recommended a reorganization. In 1858 he founded the banking house of Allen, Copp & Nisbet, he furnishing the capital. In 1859 he was intrusted by the State of Missouri with $900,000 worth of guaranteed bonds in aid of the Pacific Railroad, and disposed of them to great advantage. In the civil war, Mr. Allen, despite his large interest at stake on the border, did not hesitate in the course which he thought right. He contributed a fund to equip a company from Pittsfield, Mass., known as the "Allen Guard." He wrote to Governor Claiborne F. Jackson, of Missouri, warning him of the consequences certain to result from an attempt to take his State out of the Union. In 1866, having amassed a sufficiency of worldly goods, he proposed to retire and enjoy a dignified leisure, but it was willed otherwise. To quote Mr. Allen's own words, "I am condemned by the Almighty to hard labor for the term of my natural life. What caused the sentence I do not know, but I admit its justice and submit to it, and that certainly not merely to amass the goods of this world, for I have long since had a sufficiency of them. I have endeavored to do as many do when they think they have had enough—retire from active business and enjoy the *otium cum dignitate;* but it would not do. I exhausted my library, resorted to fine horses, fine stock, to travel—to almost everything which a gentleman can resort to in this country to engross his attention and employ his time. But I found it was not in my nature so to live, and I came back to my work and to work as long as nature will endure it. I have therefore worked on, and if I have accomplished or shall accomplish some of the enterprises I have in hand and some which I have in contemplation, I shall be satisfied in having done some good for my countrymen."

Mr. Allen, in obedience to his life sentence, returned to Missouri. A great opportunity awaited him there. The St. Louis & Iron Mountain Railroad Company, which for some time had been struggling against fate, succumbed. This railroad was sold under foreclosure of the State lien and bought in by the State. In January, 1867, the property was sold by the State to McKay Reed & Co., and from them purchased by Mr. Allen for $1,275,000. From that time Mr. Allen has devoted most of his time and capital to a development of the St. Louis & Iron Mountain Railroad and its branches and continuations, viz., the Cairo & Fulton and the Cairo, Arkansas & Texas railroads, which when completed next spring will be, in the aggregate, 700 miles in length. He also administers 2,500,000 acres of lands in the State of Missouri and Arkansas. He is also President of the St. Louis & Carondelet Bridge Company, which purposes to bridge the Mississippi at the lower part of St. Louis; President of the Pilot Knob Iron Company, controlling one of the largest iron estates in the country; President of the St. Louis International Exposition Company, which with a capital of $1,000,000 purposes to hold a yearly world's fair at St. Louis; President of the St. Louis University Club; President of the Board of Trustees of the "Berkshire Atheneum, of Pittsfield, Mass., an institution to aid in promoting education, culture and refinement, and diffusing knowledge by means of a library, reading rooms, lectures, museums and cabinets of art and historical and natural curiosities." He has pledged the interest at 7 per cent. on $40,000 for five years to endow a chair of mining and metallurgy in the Washington University of St. Louis. Also, he is still the head of the banking house of Allen, Copp & Nisbet.

* This is the title given an original lithograph published by the manufacturers, who date from "B. & O. R. R. Company's Mount Clare Depot, Baltimore, Md." The lithograph has also the following inscription: "The characteristics of this engine are—1. The use of anthracite coal as fuel. 2. The vertical tubular boiler. 3. The use of the adhesion of all four wheels. The boiler is competent to supply steam to work up to the adhesion of all the wheels at the rate of ten miles an hour, or to produce a continuous horizontal pull of 2,322 pounds, equal to drawing 211 tons on a level road at the rate of ten miles an hour, as determined by actual experiment." *See 9th Annual Report of the B. & O. R. R. Co., p. 79.* This engine has drawn, exclusive of its own weight, 17¼ tons up an ascent of 200 feet per mile for 2,150 feet, at the uniform rate of six miles per hour. See report of City Council of Baltimore, March 24, 1836. The weight of this engine varies from 7 to 8½ tons.

Phineas Davis and the "Grasshopper" Engine.

BALTIMORE, February 4, 1873.

TO THE EDITOR OF THE RAILROAD GAZETTE:

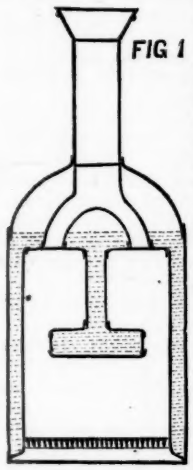
As I have undertaken to gather for you what information may be within my reach respecting the design and construction of that form of the locomotive engine first used some 40 years back for the regular and efficient traction of trains upon the Baltimore & Ohio Railroad, and which has been popularly known as the "grasshopper engine," I have prepared the following brief memoir upon the subject, which embraces all that I have been able to collect in regard to it. It is indeed to be regretted that the history of a machine of so original and remarkable features should not have been earlier written, and while the facts and circumstances connected with it were fresh in the recollection of those concerned in its production. Happily you have succeeded in securing the very accurate drawing of it, of which you have sent me a copy in the excellent woodcut now before me, and as there are one or two of the engines themselves still surviving and at work in the company's yard at their Mount Clare Station in transporting materials from one point to another of its extensive area, the memory of this interesting and useful machine is not likely to be lost. This odd nickname of the engine requiring some explanation, it may be well to say here that it grew out of the manner in which the piston rods were connected with the cranks by means of lever beams attached to the boiler, and from which long connecting

rods passed down to the cranks so as to resemble the hind legs of a grasshopper. A glance at the drawing will show the likeness plainly.

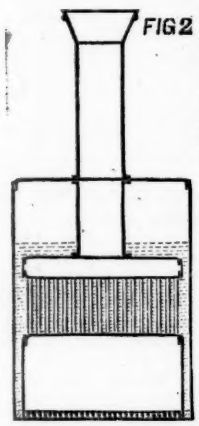
I will gladly perform the part now assigned me of assisting to save it and the name of its meritorious originator and his associates from oblivion.

The "grasshopper" engine was not the very *first* locomotive which ran upon the Baltimore & Ohio Railroad, the company, after the example of the Liverpool & Manchester Railway, having advertised in 1831 for an engine which would, upon a level grade, draw a gross load of 15 tons at a speed of 15 miles per hour upon their road as then constructed with a strap rail and frequent curves of 400 feet radius, upon which the successful experiments of the previous year with the Peter Cooper locomotive had satisfied them that steam power could be employed.

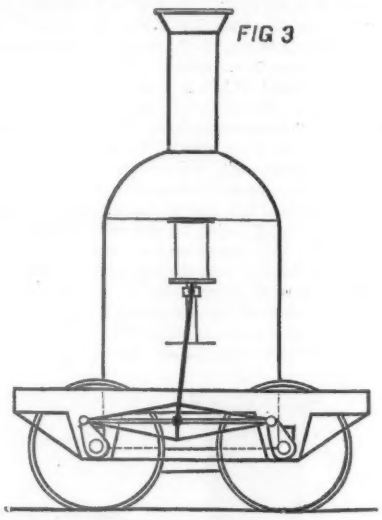
Four engines of various models (among them a *rotary*) entered into the competition; but the only one of the four which proved equal to this moderate performance was that of *Davis & Gartner*, two machinists of York, Pennsylvania. The performance was not, indeed, accomplished without certain modifications having been first made in the machine, as mentioned by the late Jonathan Knight, then Chief Engineer of the company, in his annual report of that year. The changes made are not specially described by Mr. Knight; but from a recent conversation with Mr. Ross Winans, I learn that the Davis & Gartner engine, named the "*York*," as it came from the shop at York where it was built, had a boiler of a form resembling somewhat the accompanying sketch (fig. 1), in which a pipe was dropped down from the upper or crown sheet of the fire-box, and a flat cylindrical drum called a *cheese* attached to its lower end. I am not clear about how the *top* of the boiler was shaped, but suppose it may have been as shown, so as to give steam room and allow the smoke and flame to pass out. The smoke escape may have been differently connected with the fire-box, and so as to pass immediately out therefrom at the front or back of the boiler and without going through the steam-chamber as shown; or, if carried through that chamber, it may have been in a single pipe on *one side* of the *cheese* pipe, instead of in a double pipe branching as shown.



The defect of the Davis & Gartner boiler was a want of fire surface and of circulation of water in the *cheese* and its pipe. The supply of steam was therefore deficient, and the deposit of sediment in the *cheese* could not be removed. Hence another form of boiler had to be chosen, and the tubular one of the little Cooper engine, which had done so well the year before (1830), and the patent right of which was purchased of Mr. Cooper by the company, was adopted and made the chief feature of the improved machine of 1831, called the "*Atlantic*," as shown in the sketch, fig. 2. Both the *cheese* boiler and the tubular boiler are upright. The dimensions of the former I have not the means of giving, but they must have been much the smaller of the two. Those of the latter are shown on the sketch, from which it will appear that its outside diameter was 51 inches, and that of the fire-box 46½ inches, with a height of 22 inches; the length of the tubes 16 inches, their inner diameter 1½ inches at lower end and 1¼ inches at top, and their number 282. Immediately above them was an *air chamber* of the same diameter with the fire-box and 6 inches high. The space thence up to the top of the boiler was 22 inches, and the smoke etc., passed up to the chimney through a cylindrical flue 13 inches in diameter. The water line was three or four inches above the air chamber, so that there was a steam space 18 or 19 inches high, and of the whole horizontal area of the boiler less that of the flue just mentioned.



The improvement in the form of the boiler was thus very marked. Another feature in which the Davis & Gartner engine was modified was the mode of connecting the pistons with the road wheels, which, as Mr. Winans informs me, was as shown in the sketch, fig. 3. The cylinders, upright in position, were attached to the sides of the boiler near its top, and connecting rods carried down from the cross-heads of the pistons and outside of the frame to the middle of a trussed horizontal bar connecting the cranks of the road-wheel axles, which projected through the frame. This arrangement was novel and ingenious, but it worked badly in consequence of the action of the springs due to the inequalities of the track and the alternating vertical movement of the pistons, and there were other objections to it. To what extent *in time* the "York" actually did service upon the Baltimore & Ohio Railroad cannot now be accurately known, as there are but three persons likely to be informed on this subject now living, or at least accessible to me (Mr. Winans, my brother and myself), whose connection with the company dates so far back; and after taxing my own memory and conferring with my two surviving cotemporaries, I cannot answer the question. It appears, however, from a reference to the reports of the Chief Engineer, Mr. Knight, and the Superintendent of Machinery, Mr. Gillingham, that this *experimental* engine, having undergone the "modifications" above mentioned, although not specifically described "was found capable of conveying 15 tons 15 miles an hour on a level, and, being employed upon the 13 miles between Baltimore and Ellicott's Mills, about five miles of which distance ascended at about 17 feet per mile, it usually performed the trip in an hour with four cars (4-wheeled), or about 14 tons gross load. The wheels were cast iron, 30 inches in diameter, the axles revolving in friction wheels of the Winans patent.



Spur and pinion gearing (the pinion on the axle of one of the road wheels) was used to increase velocity, and a speed of 30 miles per hour was attained upon straight lines, and 15 miles through curves of 400 feet radius. The fuel was anthracite coal, and draft sufficient to burn it obtained by a fan blast. The weight of the engine was but 3½ tons, and hence its insignificant tractive power. The "cheese" boiler was perhaps retained in the "York," but the cylinders must have been removed from their position on each side of it and placed in front so as to connect with the spur and pinion gearing on the axle of the road wheel, instead of the trussed side bars above mentioned.

This is all the extant information within my reach in regard to it, and I gather from the reports referred to that, after working a while, it was laid aside by its builders, who employed themselves in the construction—in their shops at York, Penn.—of the "Atlantic," which they placed upon the road about the 1st of September, 1832, and which was the first "grasshopper" engine, although not the full-fledged machine to which that apt yet somewhat grotesque soubriquet was subsequently, and ever since, applied.

I would here remark that although the mechanical firm by whom these engines were built was that of "Davis & Gartner," the prominent member was Phineas Davis, to whom the credit of their design is chiefly due. In the modifications already mentioned of the experimental engine "York," Mr. Ross Winans, then in the employ of the railroad company as Assistant Engineer of Machinery, took part, as he subsequently did in planning the details of the "Atlantic," and in bringing the "grasshopper" engine to its matured form and proportions, in which it became for some years the sole motive power of the road.

The "Atlantic" was a great improvement upon the "York" in all respects. It weighed 6½ tons with fuel and water, or nearly double the weight of its predecessor, would consequently draw a much heavier load, and, being geared by its spur and pinion so as to make two revolutions of the road wheels to one of the cranks, its speed was proportionally great, for which its tubular boiler and fan blast for its anthracite coal fuel afforded abundance of steam. It was indeed chiefly designed for speed in propelling passenger trains, and hence only one pair (the front one) of its four wheels was used as drivers, on which pair nearly two-thirds of its weight was made to rest. Its cylinders were 10 inches in diameter, with a stroke of 20 inches, the driving-wheels (of cast iron with chilled rims) 36 inches in diameter, but, being geared as just stated, had an equivalent diameter of 6 feet.

The performance of the engine, as calculated in detail by Mr. Knight in his report of October 1, 1832, was a gross load of 50 tons from Baltimore to the foot of Parr's Ridge, a distance of 40 miles, against an extreme grade of 37 feet per mile and curve of 400 feet radius, and with an average speed of 12 to 15 miles per hour in the ascending direction, with of course a great increase of load and speed on the return trip.

The actual work usually done by the "Atlantic" was fully up to Mr. Knight's calculations; but the engine being the first built of her model, many of the parts were found too weak to bear the strains to which they were subjected upon a road of slight construction and abrupt curvature, and hence she was at first often out of order. Her spur wheel, working into the pinion immediately on the driving axle, wore irregularly, and sometimes broke from the jars encountered on a rough track, and this was so serious a source of trouble that in the next engine a separate axle was placed on the *frame*, which carried the pinion as well as the spur wheel, and they thus worked smoothly with each other; and, there being cranks on the end of this axle, and connecting rods coupling them with the driving-wheel cranks, as shown in your woodcut, the difficulty was obviated altogether by this arrangement. The fan was driven by the exhaust steam, which operated on vanes upon the same axle with the fan, inclosed in a distinct chamber, and constituting thus a species of rotary engine attached to the back of the boiler.

The pressure of steam was ordinarily 50lbs. to the square inch, (about the same as that used in English locomotives at that time, but since greatly exceeded in both countries), which was sufficient to slip the driving-wheels when the adhesion was one-eighth of the weight upon them. The valves were worked by a *cam* so shaped as to cut off the steam at about two-thirds of the stroke.

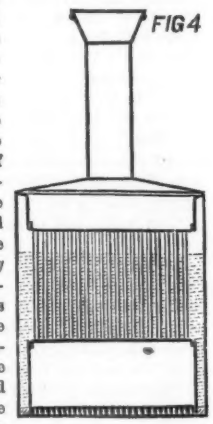
The daily expense of the round trip of 80 miles was $16, which included one ton* of anthracite coal, at $8; engineer, fireman and laborer, $3.50; oil and packing, 50 cents; estimated wear and tear and interest on cost, $3; water station expenses, $1. The engine did the work of 42 horses, the daily expense of which was estimated at $33, so that the cost of conveying passengers by steam (not including track repairs) was but half that of animal power, although the speed was nearly double.

The first cost of the engine is not stated in the reports, but is believed to have been about $4,500, at that period of low prices of labor.

Mr. Knight, in his report of 1831 upon the "York" engine of 3½ tons, had expressed the opinion that 4½ tons (of 2,240 lbs.) should be the limit of weight of a new engine; but he gives good reasons in his report of 1832, just quoted, why he was satisfied that the 6½ tons of the "Atlantic" was not too great (as it effected transportation with much greater economy), notwithstanding its more severe pressure upon the strap-rail track. In this we see the first step towards that vast increase in the weight of the locomotives at which we have now arrived.

While the first "grasshopper" engine was thus running to and fro between Baltimore and Parr's Ridge, another engine was in progress upon the same general plan, but with the view of hauling *freight* rather than passengers between those points. This engine, although intended to be somewhat lighter than the "Atlantic," had more effective power, in consequence of all the four wheels being connected by outside cranks and rods, so as to give it the adhesion of its entire weight. Its piston rods were also connected directly with the road wheels, the axle of the front pair of which was *cranked*, the gearing of the "Atlantic" being dispensed with, as a slower speed was proposed in the "Indian Chief," as it was called. The crank of the axle breaking, however, and the engine not working in some respects as well as the "Atlantic," it was decided to apply similar gearing to it; but, in order to avoid the difficulty already mentioned as due to the position of the pinion upon the axle of this road wheel, the separate shaft upon the frame, as above described, was adopted and used in all subsequent engines of this model. The "Indian Chief" came out of the shop in October, 1833, under the now name of the "Traveler." It was built and remodeled at York, like its two predecessors, the Baltimore & Ohio Railroad Company not then having shops in which such work could be done, but which were erected in 1833, as appears by the report of George Gillingham, Superintendent of Machinery, dated in October of that year.

The *boiler* of the "Traveler" resembled in the main that of the "Atlantic." The interposition, however, of the *air chamber* and smoke flue between the top of the tubes and that of the boiler made it difficult to get at the tubes for their removal and repair. In the third engine, which was placed upon the road in July, 1834, and called the "Arabian," the tubes were lengthened from 16 inches to 31 inches, and passed up to within 11 inches of the top of the boiler, the head of which was sunk to that extent to receive them. The water line stood 6 to 7 inches *below* the tops of the tubes, which therefore occupied that much in height of the steam chamber, the remainder of the steam room being in the annular space of 11 inches thence to the top of the boiler. This space would have been so contracted as to have led to *priming*, but for the *drying* of the steam and its partial superheating by its exposure to the tubes and the upper interior shell of the boiler, which made a hot-air chamber opening at the top into the smoke stack. It was apprehended at first that the tubes might be damaged in the upper part of their length not surrounded by water; but the fear proved unfounded. The tubes indeed proved, contrary to expectation in view of the frequent bursting and rapid wear of tubes in the English locomotives, the most durable part of the interior of the boiler. Their upright position saved them from scale deposit, and the superior circulation of the water, common to all vertical as compared with horizontal boilers, kept their lower ends nearest the fire always supplied with the cooler water, which tended by its greater weight toward the crown of the fire box. The constant up-and-down flow of steam and water among the tubes kept them on the outside not only clean, but smoothly polished, while their upright position prevented any lodgment of soot or dust on their inside: hence their remarkable durability. As a drawback, however, upon this advantage of a vertical position of the boiler, the deposit of sediment and scale upon the crown-sheet of the furnace must be mentioned, which it was troublesome to remove. The greater height of the center of gravity and the consequent unsteadiness of the upright compared with the horizontal boiler made it less suited to the locomotive engine, and, indeed, when it is considered that the grasshopper engine rested on wheels but about four feet from axle to axle, and that the vertical action of its pistons and connecting rods was communicated to its springs, it is remarkable that it kept upon the rails so well at the considerable speeds at which it was run, with a gal-



* When the year's account was made up the engine was found to have used 190 tons of coal in running 13,280 miles, which would give a ton for every 69 miles, or about 1.3 tons for 80 miles.

oping sort of gait, not wholly unlike the leaping of the insect from which it borrowed its name.

In the "Arabian" the waste steam was caried to the *fan* chamber by a hollow belt winding round the boiler, and within it the feed-pipe was contained, so that the water was thus heated before being pumped into the boiler. An arrangement was also made by which the exhaust steam might be thrown into the fan chamber either wholly or in part turned into a waste pipe, so as thus to regulate the draft of the furnace at pleasure.

The "Arabian," the cylinders of which were 12 inches in diameter by 22 inches stroke, was of nearly the samo weight with the "Traveler," both of them weighing about 7½ tons, or a ton more than the "Atlantic." The weight of the "Arabian" was, however, more equally distributed upon its four wheels, on each of which it was then thought not allowable to put more than two tons—and prudently enough, too, considering the character of the track, which, however, was much more severely tried afterwards, before it gave place to a better one.

The "Arabian" and all the succeeding engines of its model were built in the shops of the company, in Baltimore, and by Mr. Davis,* under a contract with the company, up to the time of his death, which occurred on the 27th of September, 1835. He had built six additional engines, making nine in all of his construction, besides the "York," his first attempt, and he was upon a trial trip with the latest completed under his own direction when he met his death in the manner detailed in the following notice of it in the ninth annual report of the Directory of the Baltimore & Ohio Railroad Company, which I extract in the words of the report. After stating that on the day preceeding the one on which he lost his life, the new engine, "Washington," weighing 8 tons, had drawn upon the Washington Branch of the road a gross load of 113 tons over the road, and up the grades of twenty feet per mile for several miles in succession, at a speed of not less than 10 miles an hour, the report proceeds to say:

"When adverting to what has been accomplished in the improvement of the locomotives of the company, it would ill become the board to omit paying a tribute of merited respect to the memory of Phineas Davis, the lamented individual who so largely contributed to the results here indicated. On the 27th of September last, he, having completed a new engine, availed himself of the occasion of trying it to take his numerous workmen on a visit to Washington. On his return, the engine, striking the end of a rail which the breaking of the iron chair had permitted to get out of alignment, it was thrown off the track, and, being on the tender, he was dashed forward against the engine and instantly killed. No other person was injured."

"Phineas Davis was the first who constructed an engine capable of being used on the road, in which anthracite fuel was successfully employed. With untiring patience he bore disappointment after disappointment, and the eminent and splendid results which ultimately rewarded his efforts are ample testimonials of his genius, and will identify his name most honorably with that great system of internal improvement which is yet to work so many and important changes in the relations of society. Of a quick and clear conception in matters relating to his profession, he possessed a calm, discriminating judgment. The warmth and energy of inventive talent were tempered by a prudent foresight and great practical skill. He seldom, therefore, took a step which was not a secure one, and the success of his suggestions when put into practice gave them from the first almost the same weight as if they had been the dicta of experience. His private worth and unassuming manners were not less remarkable than his rare abilities. The board deeply regret his loss and hold his memory in sincere and respectful consideration."

My own personal recollections of Mr. Davis fully confirm all that is here said of him. He was a man of middle stature, with a grave and thoughtful countenance and quiet deportment, and much esteemed by all who knew him.†

After his death the company's shops were leased to Messrs. George Gillingham and Ross Winans, both of whom had up to that time been in the company's employ, in their machinery department. They continued (after completing two not quite finished by Mr. Davis) to build engines upon the "grasshopper" model, and placed ten of them (including the two just named) upon the road in 1836 and 1837, making seventeen in all, and so satisfactory was their performance that it rarely happened that more than one or two were in the shops at one time for repairs. There was also one built for the "Paterson Railroad," and which plied between Paterson and Jersey City, with favorable results, for some years. Two engines of the same pattern were built by Charles Reeder in 1835, one of which exploded its boiler and was wrecked. Of the other I have no reliable account. Twenty engines of this model were therefore built altogether. The improvements upon the engine as left by Mr. Davis chiefly consisted in details relating to the steam and exhaust openings and pipes and action of the slide valves which continued to be worked (instead of the usual *eccentric*) by *cams*, of which there were two upon each shaft, differently shaped, so as to cut off the steam at various proportions of the stroke of the piston, the cam yoke being arranged so as to shift laterally by means of a lever worked by a treadle under the foot-board.

In his annual report of October, 1833, Mr. Knight speaks of these improvements as the result of the experience gained so far, and he gives detailed statements of the work performed by the engines (which more than bear out his previous estimates) and an elaborate and very favorable comparison of it with that of the English locomotives upon the Liverpool & Manchester Railway, as described in the then recently-published work of the Chevalier De Pambour.

In that report Mr. Knight mentions that Gillingham & Winans have matured a plan by which the vertical position of the cylinders will be changed to horizontal, retaining the upright boiler, which could be set some ten inches lower, and the center of gravity of the whole machine be lowered about a foot, the object being to obviate the effect of the vertical movement of the pistons upon the springs and track, and their more elevated attachment to the boiler. Three engines were accordingly built upon the new plan (the separate shaft and gearing being also retained), but only one of them was placed upon the Baltimore & Ohio Railroad. This engine weighed about 12 tons. The other two, of about 10 tons, were purchased by another company. As the Davis engine had been nicknamed the "grasshopper," so the Winans engine was called the "crab," from the position of the cylinders, which were attached to the *back* end of the frame, instead of the front as usual, thus giving it the look of moving backward instead of forward. The altered position of the cylinders and some other modifications in detail worked well on the whole; but the new engine, being still supported upon only four wheels with axles about four feet apart, its movement, *at speed*, was unsteady compared with engines of longer stretch, and so the next effort of Mr. Winans, who had now established himself in shops of his own, was to get rid of this difficulty by multiplying the wheels and lengthening the engine, still keeping the vertical boiler. Some engines were built by him on this plan (I do not remember how many), and they were succeeded by still another form of locomotive, also designed by him, with horizontal boilers, of which twelve were furnished the Baltimore & Ohio Railroad, and performed well as freight engines, for which business they were exclusively intended.

Such is the history of the "grasshopper" engine, no more of which were constructed after 1837. They had done their part in introducing steam power upon a slightly built and excessively curved road (since much straightened), and they yielded place to machines better fitted for the increasing trade and travel of this growing country, requiring greater *power*, which could only be got by greater *weight*, and greater *speed* only to be attained by a different form of locomotive. The policy of inviting native talent to compete in the design of an engine suited to the peculiar character of the road, and thus to begin *at the beginning*, instead of importing at once an English locomotive and adapting it to the road, was much criticised at the time, and the company's shops were derisively called "a shop of experiments." This was true in a good degree, but as the experiments resulted so well the company might bear the reproach with equanimity. Its neighbor, the Baltimore & Susquehanna Railroad, did import an engine from England. It was upon four wheels, too, the hind pair being large driving wheels, the front being smaller ones; the two pair being set much farther apart than the little 3-foot wheels of the "grasshoppers," the engine would not run through the short curves of that road until the front pair was taken out and a swiveling 4-wheeled truck substituted, which was the beginning of the use of the now universal mode of supporting the fronts of our locomotives, excepting those designed wholly for freight transportation, all the wheels of which are mostly connected. The engine just mentioned burned first *coke* and afterwards *wood*. The Baltimore & Ohio was not, however, the only company which thus in the outset encouraged native talent, as the South Carolina Railroad, one of the earliest of the country, opened with an engine designed by Horatio Allen (who still lives to enjoy his well-earned fame as an engineer), which had a provision for accommodating it to the curves of the road, having a swiveling truck under each end; revived of late years in the Fairlie engine.

My letter has reached a much greater length than I had intended, and I will conclude by summing up the chief characteristics of the grasshopper engine, and to what extent they belong to Mr. Davis alone, as far as that can now be known—giving due credit to those who were associated with him in bringing it to the perfection which it reached in the hands of Messrs. Gillingham & Winans, who succeeded to him as contractor for building them for the company (at a price of $5,000 each). The engine was constructed, as has been said, with special reference to the then weak track and strong curves of the Baltimore & Ohio Railroad. It was made, therefore, of moderate weight and short-coupled, so as to press lightly on the track and round the curves easily (the swiveling truck not having been then suggested); and that it must have done this last is proved by its being able to work itself through the quadrant of 60 feet radius at the street corners. It was supported upon wheels of small diameter with the same views, and to keep down the center of gravity, and also to give tractive power with a cylinder of moderate size and pressure of steam, such as was used at that time. The upright boiler was adopted in view of the advantages already enumerated, and of its successful use in the little engine of Mr. Cooper, which seemed to give the maximum of steam-generating capacity in the smallest compass, and hence to be especially favorable to the compactness required in so short an engine. The boiler, affording the readiest and staunchest support to the cylinders, was naturally resorted to for that purpose. This gave them their vertical position, and involved the lever beam and long connecting rods, or grasshopper legs. The separate shaft was an accompaniment of the system of gearing required by the small wheels, and relieved it of its objections.

The fuel used required a strong blast, and this was most effectively obtained by a fan, and this, again, was most readily driven by the exhaust steam, which at the same time was made to heat the water before entering the boiler. The valve motion might have been effected by the generally employed *eccentric*, but the use of properly formed *cams* cut off the steam in a more satisfactory manner in this engine, and at a proportion of the stroke greater or less according to the power to be exerted on the different grades of the road, thus economizing steam. It must then be admitted that, taking it as a whole, the engine was admirably adapted to the road on which it ran, and although it had to give place, in time, to another style of locomotive, it rendered good service and is fully entitled to have its memory perpetuated.

To assign to each one who had a hand in its design and development his exact share is not now possible, for the reasons stated in the earlier part of this memoir. That the larger share is due to Mr. Davis must be conceded, and I understand it to be so by Mr. Winans, to whose advice and inventive talents, however, much of the credit of perfecting the machine is undoubtedly due. What part Mr. Gillingham may have taken I am unable to say; but he may have made practical suggestions in matters of detail. The melancholy circumstances attending Mr. Davis' death would naturally lead us, from sympathy, to award him rather more than less than his share. He appears, however, to have been without question the inventor, as he was the patentee, of the mode of driving, by the exhaust steam, the fan by which alone a draft strong enough to burn anthracite coal in that form of engine was produced. He also suggested the introduction of the wrought-iron ring into the cast-iron road wheel, by means of which the chill of the tread and flange was perfected and safety from the consequences of fracture secured. Messrs. Gillingham and Winans continued the use of both these inventions of Mr. Davis, and Mr. Winans, in his extensive operations during subsequent years as a manufacturer of locomotive engines and car wheels, continued the use of the ring.

The reputation of Mr. Winans as a mechanician and a man of versatile talents and pursuits is too well established and widely known independently of his connection with the "grasshopper" engine, to need any aid from that source. The fame of Phineas Davis as a mechanical engineer must rest upon his large share in the design and construction of this machine, so original in most of its features; and hence if he should appear even more prominent in this little memoir than the facts of its history would fully sustain, could they now be all brought to light, no one, I trust will suffer wrong thereby. I am indebted, as I have already intimated, to Mr. Ross Winans, to the able reports of the company's first Chief Engineer, Jonathan Knight, to my own recollections as an assistant engineer, and afterwards Mr. Knight's successor, and to those of my brother, who became counsel for the Baltimore & Ohio Company in 1828, and still holds that office, and to whom, as Mr. Knight remarks in one of his reports, belongs the credit of suggesting tasteful embellishments in the external form and finish of the engines, in the improvement of which, although in a different department of the company's service, he took a warm interest.

BENJ. H. LATROBE,
Formerly Chief Engineer of the Baltimore & Ohio Railroad.

Fig. 1.

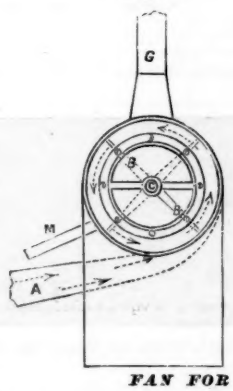


Fig 2.

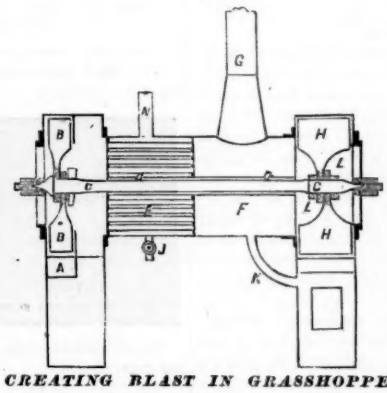
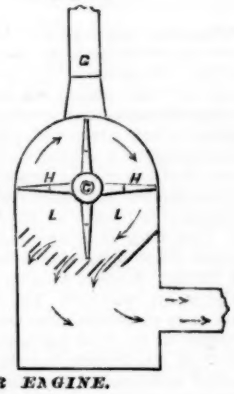


Fig. 3.



FAN FOR CREATING BLAST IN GRASSHOPPER ENGINE.

[The above engraving represents the fan blower which was used on the grasshopper engines, and referred to by Mr. Latrobe. Fig. 1 is an end view, fig. 2 a longitudinal section, and fig. 3 a transverse section through *H H* of fig. 2. The exhaust steam escaped from the engine by the pipe *A*, and, coming in contact with the blades of the fan *H H*, caused it to revolve. The steam then passed through the small tubes *E*, fig. 2, which were surrounded by the cold feed-water pumped in through the pipe *M*. After passing through the small tubes, the steam escaped into the chamber *F*, and into the

* I am not able to say positively whether Gartner was associated with him after he ceased to build engines at York, where their own shop was; but I think not.

† Since writing the above, my friend, General Walter Gwynn, one of the fathers of the engineering profession in the United States, has informed me that he visited Mr. Davis at the company's shops at Mount Clare, while he was building one of the earliest of his engines, and that when he asked Mr. D. to let him see *his drawings* of the engine, the reply was that he had nothing on *paper*, but only an outline upon a *board*, on which, after working out the detail in his head, he traced it so as to measure the parts and make them fit with exactness. This reminds one of the great self-taught *Brindley*, who planned and built the Duke of Bridgewater's canal without the help of pen or pencil, it is said.

open air by the pipe *G*. The shaft, *C C*, of the fan extended through a large central tube, *D*, and at the other end was attached an air-fan, *H H*. This was caused to revolve by the steam-fan, *B B*, and forced the air downward, as indicated by the darts in fig. 3, into the ash-pan. By this means not only was the requisite draft produced, but the feed-water was heated at the same time, and a portion at least of the exhaust steam was condensed. The water resulting from the latter process escaped from the chamber *F* by the pipe *K*. The feed-water was conducted to the boiler by the pipe *N*.

This arrangement was employed in all these engines until a few years ago, and one of the blowers is still in existence at the Mount Clare shops at Baltimore. The simplicity of the blast in the chimney will, of course, always give the latter method a great advantage over that so ingeniously and successfully applied by Phineas Davis; but for engines to work in streets, or wherever the noise of the exhaust is objectionable, this now almost forgotten method of creating a draft would obviously be very well adapted.

We will add here that twelve grasshopper engines were built for the Baltimore & Ohio Railroad, and of these four are still in use. We doubt whether there are any locomotives in existence which have done an equal amount of service. Their success, considering the time of their design and construction, is certainly very remarkable, and deserves to be recorded in the history and development of railroads in this country.—EDITOR RAILROAD GAZETTE.]

The Official Guide of the Chicago & Alton Railroad.

FEBRUARY 18, 1873.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In your issue of 15th inst. Mr. James Charlton appears in defense of his "Official Guide," and enters the plea that the ultimate expense to the company will be much less than it would cost to print the time tables separately. This must, for some time at least, remain a matter of opinion. It seems to me that if the reading matter is allowed to be loaded down by advertisements, the Guide will no longer be in demand. I, for one (and I know many of my friends also), at sight of an "advertising medium," feel much as we do after a dose of tartar emetic. That thing is being overdone. Our soul sickens at the thought of not being able to find our train time without wading through sheets of advertisements, cunningly inserted to catch our eye unawares. The plea that the Chicago & Alton are mere advertisers in the Guide is somewhat delicate. Who supplies the sinews of war and who bears the loss, if loss there be? If Mr. Charlton has the copyright of Browning's unpublished works, and if Browning be a popular poet, the Guide may be a success after all; but I fancy that the great publishers of the country would not have allowed Mr. Charlton to get ahead of them had there been the slightest chance of a demand for the complete works. The rush for the Guides is easily accounted for. I "complaisantly assume" that very few of those who rushed knew anything about Robert Browning, but having come across one of the numerous side puffs of the Guide, concluded that his works must be worth reading or they would not have been selected. Let us see whether the demand continues. Let Mr. Charlton report at the end of the third issue, and we shall have gained some knowledge, at least of the literary tastes of the Chicago & Alton patrons.

However, all this is scarcely to the point. I objected to the fashionable extravagant outlay in the advertising department of so many roads, an outlay that I believe cannot bring sufficient return to justify it. It is the old lesson which so many have yet to learn: competition often ruins, but seldom improves. If the Chicago & Alton Railroad Company had any patent for preventing other companies from imitating or surpassing its efforts, the gain to it would be great from such an enterprise; but its competitors may surpass that effort and gain the field; in its turn the Chicago & Alton must again go ahead, etc., *ad infinitum*. Where is it to end? I believe the time has come when competition must be abandoned whenever it leads to outlay; that railroad companies must consolidate their interest, if not their capital. Retrenchment and economy are urgently demanded on all sides, for without such the railroad companies cannot afford to carry it at the lowest possible rates. Competition should and ultimately will be confined to efficiency and promptness of dispatch. Expenditure must be kept down by refusing to spend one cent that does not bring a return, or is not absolutely necessary to secure efficiency.

To return to advertising, the special subject under consideration. Those in charge of that department have, in my humble opinion, neglected shamefully their duties. I speak in general terms, not of any individual. At a railroad station it is often next to impossible to find a time table or any correct information as to train time. Time tables showing connecting trains should be exhibited at every station, and perhaps in the cars also. General rules and regulations for the guidance of passengers might also be exhibited where now we have hideous posters. Guides might be published by a combination of railroad companies, in a large section, and advertisements of land, &c., belonging to the companies inserted, as well as freight rules, regulations, rates, and such other information specially connected with the railroads. The expense to each road would be small, the convenience to the public great. In the present system a tourist, if he is wise, discards all local guides and buys *Appleton's*, or the *Official*, or the *International*; but if he is foolish, he buys a valise and stuffs it full of local guides. When he wishes to lay out his journey, he must engage a room and several tables to lay out his guides, with plenty of paper and pencils. Perhaps it is not intended that the traveler shall proceed in the foolish way, but shall keep only the Chicago & Alton guide in his pocket and travel by no other line. If Mr. Charlton has succeeded in this line, we shall be glad to hear from him. If the guide be intended for those living on the line of the Chicago & Alton, and for those who come on to it, there is surely no necessity for ballast to keep it steady in their hands. Lovers of Browning are not likely to be led by any vauntings of a railroad company which may come across their paths.

In conclusion, allow me to express my regard for Mr. Charlton personally. I am one of his admirers. If indeed he has been accused of excessive economy, let him come to the front and justify it. Let him, and those who believe with him, stand forward and decry the extravagances of which I complain.

HINDOO.

Calculating Cross-Sections of Irregular Surface Line.

ARCADE, Wyoming County, N. Y., February 24, 1873.

TO THE EDITOR OF THE RAILROAD GAZETTE:

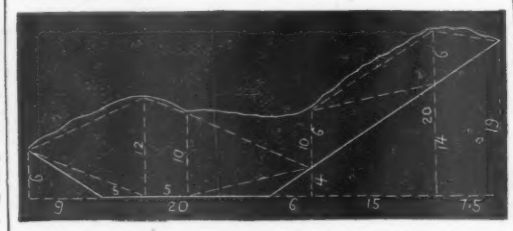
"F. D.," in your issue of February 8, in his rule to find the area of *any* cross-section, should have limited it to ordinary ground, where there is no need of taking levels between the center and slope stakes.

The following method of dividing a diagram of any cross-section into triangles, to calculate the area, I practiced 35 years years ago on the Genesee Valley Canal, in this State.

I will give an example on rough ground of a cross-section of railroad—base, 20 feet; slopes, 1½ to 1—first showing how I enter the levels in my field-book; then making a diagram from the notes; and, lastly, dividing it into triangles and calculating the area:

Station.	*Left.*	*Center.*	*Right.*
1024	19.0 5.0 6.0 12.0	10.0	16.0 31.0 33.5 10 0 20.0 19.0

The upper figures show the distances from centre; the lower ones the cuttings.



To calculate the area, begin at the left side of the diagram, for convenience:

$$\left.\begin{array}{l} 5.0 \times 6.0 \\ 12.0 \times 19.0 \\ 10.0 \times 21.0 \\ 6.0 \times 31.0 \\ 6.0 \times 22.5 \end{array}\right\} = 2 \text{ area} = 394.5$$

H. B. ALLEN.

The Question "for Scientists."

TO THE EDITOR OF THE RAILROAD GAZETTE:

Permit me to add the following observations in continuation of my discussion of the "Question for Scientists," published in your issue of January 25, and in reply to the conclusion arrived at by Mr. Chevannes in the GAZETTE of February 15 inst.

Adopting Mr. Chevannes' modification of my formula, viz.:

$$\frac{3481 \times 2 \times 3.1416}{1436 \times 60} = .25 * ft.,$$

we conclude that the eastward motion imparted to the train in 180 seconds, by the pressure of the western rail, is *one-fourth* of a foot per second. As this velocity has been imparted by a constant force, *f*, acting during a time, *t* (=180 sec.), we have by equation (23) Bartlett's Analytical Mechanics,

$$f = \frac{m\,v}{t} = .0014\,m \ldots\ldots (1)$$

A "foot-pound" represents a force that would be expended in lifting one pound one foot.

But *one pound* having an upward motion of *two feet* per second, when not influenced by any force, would, if brought under the influence of gravity, have its motion totally arrested while it ascends through a space of one foot. Hence the equivalent of a "foot-pound" may be represented by a *weight* of one pound multiplied by a *velocity* of two feet per second.

Now suppose the train to weigh 1,000,000 lbs., and let x = the number of pounds weight that, when moving with the velocity .0014 foot per second, will equal one foot-pound, then we shall have

$$.0014\,x = 2, \text{ or } x = 1429 \text{ lbs.}$$

Hence, for every 1,429 lbs. of the weight of the train, we shall have a constant lateral force of *one* foot-pound; consequently, the lateral pressure produced by the whole weight of the train is $\frac{1000000}{1429} = 700$ foot-pounds.

That is, if a train weighing 1,000,000 lbs. runs north or south, on a level track, with a velocity of 20 miles per hour, the lateral pressure expended on the right-hand rail per second, resulting from the earth's axial motion, would raise 700 lbs. one foot high; or, because the train would pass over about 30 feet of track in one second, the lateral force on each foot of rail, while the train passes over it, would be sufficient to raise one pound 23 feet high.

As this result differs very widely from that arrived at by Mr. Chavannes, it may be proper that I should show wherein his investigation is effective, which I think will not be difficult. For that purpose I will adopt Mr. C.'s equation, viz.: "$Q = wt.\ h$." In this equation it is obvious that h is the height due to the velocity .0014 feet, which, by equation (25) Bartlett's analytical mechanics, is .0007 feet.

$\therefore \quad Q = 1{,}000{,}000 \times .0007 = 700$ foot-pounds,

which corresponds exactly with the result I obtained. Again, adopting the formula *used* by Mr. Chavannes, viz.:

$$Q = \frac{wt.\ v^2}{2g}$$

because g in this formula should represent the constant force, f, as represented in equation (1), we have:

$$Q = \frac{1{,}000{,}000 \times (.0014)^2}{2 \times .0014} = 700 \text{ foot-pounds.}$$

Having, I trust, sufficiently established the correctness of my conclusion, I am, I think, justified in the opinion expressed in my former communication, viz.: that the influence of the earth's axial rotation *may*, in some instances, be made manifest by the "creeping" of the rails.

J. E. HENDRICKS.

DES MOINES, Iowa, February 22, 1873.

* In my former communication I omitted the use of the factor, 2, in the left-hand member of this equation, by mistake, and consequently my result was only half what it should have been.

A Criticisim of "Hoosier's" Bridges.

TO THE EDITOR OF THE RAILROAD GAZETTE:

As I see by your last number that none of those who so justly criticised "Hoosier's" methods of earthwork computations have undertaken to render the same service to the "Young Engineer" for whom he is writing, with regard to his designs for timber work, I send you the following criticisms.

I would premise that though I may not always qualify or limit a statement, I am aware that some may differ from me on minor points, though I doubt not on most they will substantially agree. I shall proceed to examine his designs *seriatim*, as each one of them seems to me in more or less particulars to be an example of bad, or at least antiquated, construction.

In open culvert, No. 1, as in all culverts through which water flows, the mudsills should be carried entirely across the structure; also, the stringers should be cut off flush with the back of the logs, as, if the extension shown sustains any load, the stability of the structure is exposed to disturbance, and if not, it is useless.

The closed log culvert, No. 2, should not be used under any circumstances. The opening shown, about 10 x 12, is too small, however little water may have to pass through it, and it is liable to be frequently clogged. Box culverts of logs, rarely less than two feet square, are still in use on some roads, but are passing out of date and should be avoided where an open culvert or trestle can be substituted.

The instructions given to extend these culverts two feet beyond where they are theoretically required may be a harmless precaution, but in Nos. 3 and 4 we are taken to the opposite extreme. "Hoosier" shows us a cap 10 feet long and uses a 4-inch batter, which in a 6 feet bent makes his sill 14 feet long. The bank, however, is usually 14 feet on top, and the foot of it would be 9 feet beyond the end of the sill. He should use a cap at least the width of the bank, batter 6 inches, or better still 9 inches, to the foot, and lengthen each successive plank below the cap two feet, giving a one-to-one slope on the ends. These planks should not be cut off to a line, but left with square ends, thereby saving needless work and gaining some additional support to the bank.

The instructions given for trestle bents, No. 5, are exceedingly open to criticism. Saw mills do not seem to be indigenous to "Hoosier's" locality, and in that case the sizes he gives for timber may be the most convenient, if not the most economical; but he seems to have overlooked the fact that more than half the timber used on railways at the present day is cut in saw mills. When this is so, a 9 x 12 or 10 x 12 batter post is ample, and 9 x 12 timber also is sufficiently large for culvert No. 1. No allusion is made to guides or sway braces. On bents over 12 or 14 feet in height, 3 x 10 sway braces spiked to each stick of timber with three 7-inch spikes should always be used; on bents of 18 feet or over, two 4 x 10 guides, placed 12 feet below the cap and bolted together through each post and batter post with two ¾ bolts, should be added; and, on bents of over 20 feet, a second set of sway braces and a set of four 5 x 10 longitudinal girts, spliced at each bent, or every other bent, and bolted on with two ¾ bolts. It is difficult also to give a trestle proper stiffness without a 3 x 12 or 4 x 12 stay plank, or, better still, a 6 x 8 longitudinal tie spliced together at the joints, boxed on to each cap and placed out near the end of it. The cap, also, should generally be 14 feet long—and on high and long trestles 16 or 18 feet—for the sake of the greater stiffness thus obtained from the longitudinal ties and sway braces, independent of the fact that no trestle should be so built that any one caught on it by a train has no method of escape. The batter post is then better set 6 or 8 inches from the post. "Hoosier" does not allude to split stringers, and informs us that a solid stringer is the best; but it is doubtful if it is not better to split the stringer, even if it has to be sawed in two by hand. In one instance which has come to my knowledge a train passed in safety over a trestle with split stringers, where the foundation of one bent had been entirely washed away and it hung suspended from the stringer. A moment's calculation will show this to be always possible with a 7 x 14 stringer for 12½ feet spans, or a 7 x 16 for 15 feet spans, as there is always one continuous stringer on each side, and when the stringer is bolted through at intervals of about 5 feet, it is to some extent in the condition of a beam fixed at both ends. With a solid stringer disaster would have here been certain.

The spans which "Hoosier" recommends, of 12½ feet, are well enough for low trestles, but when the bents are over 16 or 18 feet, it is more economical and gives an equally stiff structure to use 15 feet spans and 7 x 16 split stringers. It is better to economize in this way than to allow less than 6 inches for a tenon, as he tells us we may do "where timber is very valua-

ble." His nomenclature also is rather unusual, the sticks which he designates as "cap-sills," "base-sills" and "plumb-posts," being usually known to the unlearned simply as caps, sills and posts, the term "cap-sill" being used, if at all, for a stick which is at once a cap for piles and a sill for a bent.

Many would think it bad practice also to use two different batters for trestles and to bill timber to fractions of a foot, though on these points opinions differ.

The two-story bent, No. 8, is open to all the criticisms on No. 5; but that whole type of construction is antiquated, the rigid and graceful cluster-bent trestle built of 8x8 stuff without tenons or mortices having almost completely supplanted it. It would occupy too much space to give details of this, but the "Young Engineer" is recommended to take the first opportunity to post himself on it.

In the bent for a bridge abutment, No. 6, the center pile is placed in the middle of a beam 12 inches deep and 12 or 14 feet long. Before it can sustain any appreciable load the stability of the other six piles must be destroyed. In No. 7 the object of the brace shown, if used at all, is not to "support the corbel," which is an absurdity, but to add something to the longitudinal stability. In most cases it would be better to leave it out altogether, shorten the corbel and rely on a firm connection with the bank.

A. M. W.

MONROE, Mich., February 12, 1873.

A Problem For Solution.

CARTHAGE, Mo., February 25, 1873.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I send you the following problem for solution: To lay out a turnout curve from a five-degree curve, both curves turning in the same direction.

Given: frog angle No. 7 = 8° 12'; gauge = 4ft. 8½in.; throw = 5 feet; length of switch rail = 24 feet. To find the frog distance and the radius of the turnout curve.

M. N. R.

Regulation of Fares and Freights by Law.

The fourth annual report of the Railroad Commissioners of Massachusetts has the following relating to the regulations of fares and freights by law:

By Chapter 58 of the Resolves of 1872, this Board was directed "to consider the subject of regulating railroad fares and freights by law, and report in the form of a bill or otherwise on the first week of the next Legislature."

This question was discussed at some length in the last annual report of the Board (Third Annual Report, pp. 170-4). Since that report was made the whole subject has been most thoroughly investigated by a joint select Committee of both Houses of the British Parliament, and the evidence and documents submitted to that Committee, and its own conclusions thereon, have been published in a "Blue Book" of more than 1,000 folio pages. In various of the State Legislatures of this country, also, measures have been brought forward, of which copies have been transmitted to this Board, all of which bore closely on the matter referred to in the foregoing resolve. There is, indeed, no question connected with railroad legislation which has occasioned during the last forty years so much discussion or so many statute enactments as the attempt to regulate fares and freights by law. There are now in force on the statute books of various countries laws of every conceivable description, from a simple act, establishing charges so much per mile for each traveler or ton of freight carried by rail, to enactments of the most elaborate nature, under which roads are classified, goods enumerated, periodical revisions provided for, and differential, special and through-rate tariffs, with distinctions of terminal charges, are all specified in detail. The efforts in this direction have, indeed, been systematically pursued, both in this country and in Europe, from the first inception of the railroad system down to the present day.

In the earlier days of the railroad system, and especially in America, the acts regulating fares and freights were very simple, and apparently there could be no difficulty in their enforcement. They limited charges to so much per mile for each passenger and for each ton of freight, adopting what is known as the equal-mileage rate. Economically there can be no doubt whatever that this legislation was founded on a wrong principle. If the amounts paid by the public are in any degree to correspond to cost of the services rendered by the corporations, then the distance that a person or thing is carried has very little necessary connection with the cost of carriage.

This principle is perfectly well established, and has been repeatedly dwelt upon in the reports of this Board. Its truth can be made very apparent by a simple illustration. Lynn is ten miles from Boston and Chicago is a thousand. An article of merchandise going to the one place or the other has to be received, handled, stored, placed on a car and forwarded; on reaching its destination it must be unloaded, stored, and delivered to the company, or received and unloaded by the consignee; in either case, the car is necessarily subject to delays during which it earns no freight. Under these circumstances it is very apparent that the fixed cost incurred by railroads in the work of transportation—that cost which is common for all articles or persons, no matter how long or short a distance they are carried—must constitute a very considerable part of the whole cost. So obvious is this fact, that it is well known that the corporations earn large net profits on their long business at a third or quarter of the rate per mile, which is barely remunerative on short business. The simple and obvious fact, that wheels earn money while they are in motion, has constantly been disregarded by those seeking to frame laws regulating fares and freights. If a car be loaded with passengers or goods and started on a journey of 2,000 miles, the wheels of that car are steadily earning money for days together, though moving, perhaps, at low rates; if, however, the cost of starting that car, including the fixed outlay of the corporation in officers, employees, station buildings, real estate, rolling stock and road-bed—an outlay which is in large degree the same for long transportation or for short—if this cost has to be distributed over a few miles only in which the wheels are in motion, then it is evident that the cost of transportation per mile must largely increase. If it is limited by law and not allowed to increase, then the long traffic must pay a loss on the short traffic.

As regards merchandise, this is so apparent it needs only to be stated to be understood. Of course this economical principle must not be confused with the abuses perpetrated by the railroad corporations in charging heavier rates to intermediate than to competing points, or with the extortions at times practiced on local business.

As regards the carriage of passengers it is equally true. The longer the distance traveled the greater the profit on each passenger, and, numbers being equal, the cheaper he can be carried. In practice it is apparently otherwise, as it is notorious that fares for short distances are the lowest; but this is apparent only, and is due to the numbers transported. The accumulation of small profits, by dividing the cost of running the train among vast numbers of persons, operates in exactly the same way as if it were distributed over a great distance measured in miles.

The equal-mileage laws were, therefore, founded on the erroneous principle that the fare or freight should be proportioned to the cost of carriage, and the cost of carriage was held to be uniform without regard to distance. An infinite number of acts based on this principle are to be found in the statute books of this country. Nowhere, however, has the system been more persistently followed out than in Ohio. In that State there are at least nine distinct rates for the transportation of passengers and freight, authorized by law, and yet others are under discussion. The matter has been incessantly legislated upon, and yet the State Railroad Commissioner, in his report for the year 1870, asserts these laws are the most fruitful source of complaint, and that "there is not a railroad in the State, whether operated under a special charter or the general law, upon which the laws regulating rates are not in some way violated nearly every time a regular passenger, a freight, or mixed train passes over it.

"On those roads where scrupulous efforts are made to act within the limits of the law, it is violated in some instances by charging passengers who fail to purchase tickets an excess of regular ticket fare, and in others by charging an excess of the legal rate for short distances, upon the purchase of tickets; and in almost every instance where light and bulky articles, such as furniture, willow-ware, feathers and the like, are carried, a greater rate per ton per mile is charged than the law allows, and articles of a hazardous nature, or of great value, are charged in excess of their true weight. While this is done often without complaint, and the justice of the rule is conceded by many, it is nevertheless a violation of the law." * * *

"A strict enforcement of the provisions of the law would, however, compel some companies to ultimately suspend business, prohibit the transportation of certain articles by rail, or compel their transportation below actual cost."

In their report for 1872, the Commissioners referred to the English system of Parliamentary trains as an exceptionally successful result of legislation on fares and freights. The law in this case was intended to compel the companies to provide certain slow and cheap trains at a low rate of fare for the vast population of the very poor class which is to be found in Great Britain. This result it was implied the law had accomplished. The report of the Parliamentary Committee, which has just been referred to, throws grave doubts on this conclusion. On the contrary, the Committee says that "The history of the traffic in third-class passengers affords a strong argument against attempting to foresee and provide for a want of this description by imposing general, compulsory and permanent obligations on railway companies. It has been shown that Parliament, anxious to protect the lower classes, at any rate, from the apprehended monopoly of railway companies, imposed special obligations on the companies supposed to be in favor of these classes, and attached to these obligations a special exemption from railway taxation. It has also been shown that railway companies, in their own interest, are now doing for third-class passengers more than Parliament ever thought of requiring; that third-class traffic is one of the most growing sources of profit, and that the present operation of special legislation on the subject is to give a very questionable exemption from general railway taxation, to create confusion and litigation, and to give the companies inducements for withholding from third-class passengers facilities which they would otherwise give. The ill-success of this attempt may well justify hesitation in entering upon further general legislation of the same kind."

The familiar law in force on the New York Central road, and which is very frequently cited as an instance of the successful operation of simple laws regulating fares, is of a different character. Under it two cents per mile is the regular fare which the road is allowed to charge, and the rule applies to all trains, descriptions of travel, or rates of speed. No package, commutation or season ticket is sold at any reduced rate, and consequently the man who travels every day and by accommodation train pays exactly the same rate (2 cents) per mile as he who travels once a year by express.

When a similar law, applying to all roads in the Commonwealth paying more than 8 per cent. dividends per annum, was proposed in the Legislature of 1871, the discussion upon it elicited such unexpected results from its operation that the measure was rejected. For instance, though the bill was limited to roads paying annual dividends of 8 per cent. and upwards, the effect of competition made it apply to other roads which either paid less dividends, or, in some cases, had never paid any dividend at all; practically threatening such roads with bankruptcy. Again, there is not a considerable business center in the Commonwealth which is not surrounded by towns in which people have settled, built houses, and effected every arrangement for residence, relying upon a regular and very cheap access by rail to their places of daily business. A law which substituted a uniform rate of 2 cents a mile for the commutation rates at which such persons now travel would necessitate an entire change in their modes of life. Such a system might work well where a community has grown up under it; if, however, suddenly by act of Legislature introduced into a community which has established itself under the discriminating tariffs always hitherto in use in Massachusetts, the Commissioners do not see how it could fail to produce most disastrous results. How serious, as regards regular season-ticket passengers, such a change would be may be inferred from an examination of the tables at the close of this report (No. 127). It will be seen that those who travel most on the roads of this State, instead of paying 2 cents per mile, now pay but from 1¼ cents to 1½ cents per mile.

The rule of uniform mileage rate is also wholly opposed to the fundamental principle of taxation, that the burden should in all cases be so imposed as to rest most heavily where it will be least felt. The man who travels every day over a given route has a right, on every principle of economy, to buy a passage at wholesale rates, and to him a concession is a matter of great moment; whereas it is of comparatively little consequence what he pays, within reasonable limits, to the man who travels very rarely. A law, therefore, which imposes an additional cent per mile on the daily traveler to give it to the occasional one does not seem to place the burden of taxation where it is least felt.

The Commissioners are inclined to believe that the system of discriminating rates now generally in use on the Massachusetts roads is not only more profitable to the corporations than the uniform price per mile system of the New York roads, but it at the same time is more advantageous to the traveling community through its practical adjustment of the burden.

The equal-mileage rate has not only been found to be wrong in principle, but its universal application is apparently out of the question. It might indeed be practicable—if its expediency were admitted—if all the railroads in the State were consolidated into one corporation and operated by one responsible management. In such case it would be possible to strike an average, and, by making the profits of one portion of the system counterbalance the losses on another, arrive at the basis of a law. Such a policy of consolidation, however, has never been encouraged by the Legislature of Massachusetts. There are, accordingly, now in this State no less than fifty-five corporations, owning on an average forty miles of road each, while some thirty-five distinct boards of managers control about sixty miles each, varying from 250 miles in the case of the Boston & Albany to less than six in that of the Fall River, Warren & Providence. These corporations represent almost every conceivable form of railroad existence: some are very wealthy, others are very poor, and yet others are bankrupt; some pay dividends, but many do not; some are through roads, others are local branches; some run through large cities and through a level and densely populated region, others are constructed through broken and sparsely settled districts; some find their profit in carrying passengers, others in carrying freight, and yet others in the two combined; some derive a large income from the suburban travel of those holding season tickets, others have scarcely any local travel at all. To take such a system as this and to apply to it one hard, unyielding law of charges, would be an experiment which the members of this board are not prepared to recommend. In their opinion it would be not only wrong in principle, but impossible of application.

It remains to consider the expediency of special laws regulating in detail the charges of particular roads; and general laws classifying roads, and regulating charges in accordance with such classifications, discriminating for all the possible differences of condition or vicissitudes of traffic.

The precedents for special laws regulating in detail the charges of certain roads to which alone they are applicable, are very numerous in European legislation. They have, however, by no means, resulted advantageously. Of them the Parliamentary Committee of 1872, says: "Legal maximum rates afford little real protection to the public, since they are always fixed so high that it is, or becomes sooner or later, the interest of the companies to carry at lower rates. The same thing is true of terminal charges. The circumstances are so various and so constantly changing that any legal maxima which might now be fixed would probably be above the charges now actually made, certainly far above those which will hereafter be made. Indeed, attempts made in 1861 and 1866 to fix a maximum for terminals broke down, because the only maximum that could be agreed upon was so much above the charge then actually made to coal-owners that the coal-owners feared it would lead to a rise in that charge."

And again: "The attempt to limit rates and fares by the principle of fixing a maximum has almost always failed in practice, and is almost always likely to fail, for the simple reason that the Parliamentary committees and authorities by whom such limits are decided, cannot do otherwise than allow some margin between the actual probable rate, as far as they can forecast it, and the maximum rate; and cannot foresee the contingencies of competition, of increase in quantities, of facilities or economy in working, or of alteration of commercial conditions, which may occur in the course of years after such limits have been arranged by them."

The result of thirty years of successive and wholly abortive effort in this direction in England has been that Parliament has at last settled down in the conviction that the development of and necessities of trade in practice always have nullified, and inevitably must nullify the provisions of special acts, no matter how carefully and skillfully they may be prepared. This, too, has hitherto resulted from common consent, all parties recognizing the fact that these enactments did not possess the flexibility absolutely requisite to the movements of modern commerce.

In the United States the difficulties in the way of this class of legislation would be infinitely greater than in England. There the several roads are, at least, throughout their entire lengths, under the control of one central legislative power. In America this is not the case. Few roads of any importance lie wholly within the limits of any one State, and the process of consolidation is rapidly reducing the number. Practically, in every case, the laws of any one State apply only to the segments of an entire line. The real seat of an existing grievance is often, therefore, a thousand miles removed from the point where it makes itself felt, and where the remedy is asked for. Were these difficulties all removed, the most serious difficulty of all would still remain. To be done successfully, this work must be done very thoroughly and very intelligently; those having it in charge must be thoroughly informed on the whole theory and practice of transportation by rail, and fully alive to all its fluctuations and vicissitudes. The labor involved, if the laws were to remain anything more than dead letters on the statute book, would consequently be enormous, and any Legislature which undertook it must not only remain in continuous session, but must contain within itself an unusual proportion of railroad experts. Under any other conditions, the experience of Great Britain would but repeat itself.

The only other method of dealing with the subject which suggests itself is through general laws classifying roads and regulating charges in accordance with these classifications, in such a way as to allow for all probable differences of condition or vicissitudes of traffic. This is the plan now most in favor in this country, and a number of attempts have been made to devise a satisfactory form of law to meet the case. One of these has been placed upon the statute book in Illinois, and others have been prepared and submitted to the Legislatures of other States. It is impossible to speak certainly of such a system in advance; but the Commissioners are unable to find in it anything which has not been repeatedly tried with unsatisfactory results elsewhere. It is the English measure of maximum special rates generalized so as to cover the case of several corporations instead of one. It would appear that the more such measures are extended in their operation the more complex they become, and the greater must be the difficulties in the way of their successful operation. Whatever weight attaches, therefore, to the experience which has been earned respecting the simpler and earlier experiments, attaches in a yet greater degree to the more general and complex. The Legislatures undertaking to deal with the subject have but a partial jurisdiction over it; under the effect of competition, the laws intended to be applicable only to roads of one class become applicable to those of another; there is no discrimination as regards special requirements, either of localities or corporations, provided they fall within the lines of classification, and a passenger road may find itself put on the same footing as a mineral road; it is almost an impossibility that any measure could be framed at once sufficiently precise and sufficiently flexible to meet the requirements of so complex a system, and even if it were possible to frame it, it is extremely improbable that it could pass the ordeal of any legislative body.

The final difficulty with all legislation of this class is its excessively dangerous and politically corrupting tendency. It forces the corporations, whether they wish to come there or not, into the lobby of the Legislature and the rooms of committees and commissions. They are forced there for the protection of their interests; for the essence of the system is that certain persons, whether the Legislature itself or officials designated by the Legislature, have devolved upon them the responsibility of establishing the revenue of property belonging to others. The Commissioners have grave doubts as to the success of any effort at the regulation of the railroad system which practically effects a separation between the ownership of a railroad and its management.

Entertaining these views as to the result of their investigations, the Commissioners have not thought it expedient to report any bill or form of law, in which it would be apparent that they themselves entertained little confidence. It is unnecessary to add, however, that should the Legislature, or the Joint Committee on Railways, arrive at a different conclusion as to the expediency or practicability of legislation of the nature of that under discussion, the members of this Board will contribute every assistance in their power toward maturing an effective measure.

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Editorial Announcements.

Correspondence.—*We cordially invite the co-operation of the railroad public in affording us the material for a thorough and worthy railroad paper. Railroad news, annual reports, notices of appointments, resignations, etc., and information concerning improvements will be gratefully received. We make it our business to inform the public concerning the progress of new lines, and are always glad to receive news of them.*

Articles.—*We desire articles relating to railroads, and, if acceptable, will pay liberally for them. Articles concerning railroad management, engineering, rolling stock and machinery, by men practically acquainted with these subjects, are especially desired.*

Inventions.—*No charge is made for publishing descriptions of what we consider important and interesting improvements in railroad machinery, rolling stock, etc.; but when engravings are necessary the inventor must supply them.*

Advertisements.—*We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

UNJUST DISCRIMINATIONS.

The decision of the Illinois Supreme Court on the law prohibiting the collection of a larger amount for carrying freight any given distance than for carrying it a greater distance, the text of which we publish elsewhere, was doubtless anticipated by nearly all good lawyers at all familiar with the subject. The Court, in substance, says that the Legislature can only prohibit unjust discriminations, and that all companies charged with violating such a prohibition must have an opportunity to show that the discriminations complained of are not unjust—that is, substantially, that a judicial tribunal must decide the justice or injustice of the complaint. It is hard to see how else any semblance of justice could be done to the carrier.

But this decision opens another question of the greatest importance and extraordinary complexity and difficulty: What is an unjust discrimination? The Court decides that the Legislature may properly prohibit such discriminations, whether between persons or places. It also says that the fact of competition at one place and a want of it at the other will not justify a discrimination against the latter.

In this latter statement the Court, we have no doubt, has erred. It was not one of the points coming up for decision, and the examination of it and expression on it were entirely subsidiary.

In the current discussions of the relations of the railroads to the State, we hear one side classing the railroads as pure monopolies, and the other treating of them as subject to the ordinary laws of competition. Both are about half right and half wrong. While for a large part of their traffic railroad companies have no other check on rates than the diversion of industries and population to other lines, or the checking of growth on their own, for another large part they are, for the largest part of the time, subject to a competition which seems to be close in proportion to the want of it on the other traffic. This is not everywhere true, but it is, we believe, quite generally so in Illinois; and, in the existing condition of things, it is the law under which transportation companies must work.

Thus the problem for the companies should be: given the amount of profit to be made upon the investment, to adopt the policy which will give the largest net receipts.

The error commonly made is in assuming that the rate of profit should be uniform on all traffic. It will not be difficult to show that a uniform rate of profit must necessarily limit traffic and compel the payment of the income on the investment by a smaller amount of business—that is, make higher rates necessary.

Take, for instance, a railroad 100 miles long in a direct line between two markets, and suppose that a line 150 miles long, of the same cost per mile, has its termini at the same cities, serving a country at some distance to one side of the short road. Now it being granted that the roads shall earn a certain fixed interest on the investment, be it 5 or 10 per cent., the gross traffic on each must earn this interest. We give uniform rates—that is, rates giving uniform profits in proportion to expenses—to all non-competing stations sufficient to produce this income. If we make similar rates to termini, those of the long line must be the highest, and therefore it will get no through traffic. Unless, therefore, it gives lower proportional rates for the competing points—that is, unless it discriminates against the way stations because of the competition at the termini—*the way traffic must pay the entire income.* The policy in this case, and in all cases of competition for traffic, is to accept any rates at competing points which will pay a profit over expenses. If our long line has to pay 6 per cent. interest on $7,500,000, or $450,000, the way traffic will pay the whole if no discrimination is made in favor of the competing points, perhaps at an average profit of 40 per cent. But by accepting through traffic of a million of dollars which pays only 10 per cent. profit, the charges on way traffic will be reduced by $100,000, or about 9 per cent.

It is evident that the traffic of a road must support that road, that the greater the amount of profitable traffic the less may be the average rate, and that any addition of traffic whatsoever which more than pays all the expenses of carrying it decreases the average rate on the other traffic necessary to produce a given income.

And this just and advantageous discrimination of rates may be made where competition does not exist. On almost every line there is a certain amount of traffic which must go over that line, and it is usually for this traffic that the road is constructed. Simplify the matter by supposing a road with but two stations, one at a port and the other in a district where the only shipments are wheat. A rate of ten cents a bushel enables us to support our road and pay interest, the profit in carrying at that rate being 50 per cent. Now a quarry at our wheat station affords stone for which there is a demand at the port, but only at prices which leave a profit of but 10 per cent. on the charges for transportation. It is evident that every carload of stone carried at low rates reduces the tax which must be levied on the wheat, and the farmer is benefited by a discrimination in rates which enables the quarryman to enter the market and contribute to the support of the road.

We do not argue that there are no unjust discriminations, or that such discriminations should be permitted; we only aim to show that the fact of carrying a ton a greater distance for less money, or one kind of freight for *less profit*, as well as a less sum absolutely, than another does not prove an unjust discrimination, and that such discriminations are in fact often necessary, and for the benefit of those shippers who pay the highest rates and profits. Competition is often excessive and not infrequently makes rates absolutely unprofitable, to the disadvantage of all non-competing points. But so long as competition is permitted at all, it is better for the non-competing points on any line that their line should carry from the competing points so long as it gets rates which pay it any profit. In the case decided by the Illinois Supreme Court, it was the short route which was complained of, and the rates at the competing point (Bloomington) are kept down, apparently, more by a Toledo than by a Chicago railroad. In this case the two Chicago roads seem compelled to carry lumber cheaply from Chicago—at a rate of profit, doubtless, which if applied to all the traffic would make the net earnings unduly small and return an insufficient income on the investment—or else give up that traffic entirely and make up the loss by increased charges on other traffic, if they should make it up at all.

There are other questions connected with the discriminations by railroad companies which are of extreme difficulty. We were about to say that there can be no justification for arbitrary discriminations of any kind; and there can be none for such as give advantages for traffic or property owned or controlled by company officers, if given on account of such ownership and control, as they too often are. But in some matters arbitrary discriminations must be exercised. The very establishment of a station, for instance, is necessarily a discrimination against one place and in favor of another, against one group of land-owners and in favor of another. So in fixing the stopping places of suburban trains. The more the population can be concentrated the fewer the necessary stops, the fewer the stops the greater the average speed, the greater the speed the better for the suburban travelers and the suburban traffic. But if we fix a station on this pretty hill, will not the owner of the beautiful river bank half a mile further, and the man who has laid out a paradise of gardens a mile beyond that, charge that we have discriminated against them unjustly? We have discriminated arbitrarily, as we had to, for the discriminations had to be made; and having half a dozen fortunes to distribute, and a gross of candidates for them of apparently equal claims, we give the favor to six and withhold it from a hundred and thirty-eight.

STATE OWNERSHIP.

We publish this week a large amount of matter concerning the relation of the State to railroads, a subject which is considered with unusual interest at this time in some parts of the country, and indeed presents itself with almost every session of the Legislature in some States. The part of the report of the Massachusetts Railroad Commissioners on "The Regulation of Freights and Fares by Law," which we republish, gives the conclusions on the subject of regulating laws which have been reached by the most competent tribunal in the country, after years of study more profound, extensive and minute than has been given to it, in this country at least, by any other person or body. This fact—that it is a decision made with a full knowledge of the subject—gives unusual weight to its conclusions. These are, substantially, that the subject is too complex in its nature to be regulated by inflexible laws, and that all attempts at such regulations, whether in Europe or America (and the number and variety of them have been great), have failed either in justice or effectiveness, or both.

In the speech made by Mr. Charles Francis Adams, Jr., in behalf of the Commission, (a speech called out by propositions now before the Legislature to utilize the Hoosac Tunnel, the property of the State, in a new through line from Boston to the West) we have the Commission's solution of the problem. They would have the State abandon all attempts to regulate rates, etc. by statute, and make it the manager of a part of the railroad system of the State, for the purpose of putting a check on the management of all the private lines. This, it must be understood, is not because they believe the State can manage railroad business more economically or effectively than a private corporation, but because it can do it more unselfishly; and, while they believe the competition of the State would check overcharging and arbitrary rules and conduct on the part of private corporations, they believe also that the competition of the private corporations, working to make the greatest possible profit with the least possible outlay, would tend to force the State to maintain an economical and wise management on its part.

This proposition, coming as it does from Mr. Adams, carries more weight even than is due to his familiarity with the question at issue; for, as every one who read his speech on the political issues last summer will know, Mr Adams is an extreme opponent of the interference theory of government, would have the State engage in no industry for the sake of profit, and has no faith in its ability to do any work better or more economically than it is done by individuals who are interested in the profits of such work. But the business of transportation by rail, he concludes, is not subject to the competition which governs nearly all other business; at least, is so removed from competition as to withdraw it from the operation of ordinary economical laws. And his plan of State ownership is adopted chiefly or largely because he believes by it competition will be introduced, and railroad business returned to subjection to the laws which govern ordinary business.

This proposition is opposed, on the part of the public, by the argument that the State is likely to be inefficient and uneconomical in its management, and that, therefore, it will either fail to form a check on the other railroads, or do so by rates which will not pay the State, and make necessary a considerable tax. This argument is a strong one; for though some things are done well and economically by governments, it is usually by governments with a more centralized power and a more skilled and permanent civil service than exist in this country, and where the "man inside politics" is less of a power. Whatever virtue there may be in the plan can only be exercised by carrying it out well. But the Commission have faith that the competition of the private corporations will have great influence in compelling good management, and that the managers of a State road will be further impelled toward economy by the certainty that the people of the State would not continue the experiment (and their employment) if it did not pay.

On the part of the railroad companies, an objection is

made that the State would be likely to establish rates which would render their traffic unprofitable: but this is on the supposition that the State would be satisfied with an insufficient profit or with none at all. So long as the State aims to do its business at a satisfactory profit, there will be no danger to the other companies; for they will certainly be able to do work as economically as the State.

There are some considerations which might lead the corporations to favor such an experiment; for it would be likely to demonstrate (in case the State road should be worked profitably) the fallacy of so many of the popular complaints against railroads in a way which would reach the people more generally and convincingly than any arguments or reports of corporation experiences can; and the endless interferences, actual or threatened, which do more or less injury, would be brought nearly to an end. This is a result well worth trying for. We shall never have done with needless, costly and harmful interferences until the public understands better the nature of the business of transportation and the complexity of the laws which govern it. If such knowledge is effectively and generally taught by the operation of a State road, that will be a public benefit, truly, but one, too, which will be of especial value to the railroad companies.

Illinois Railroads.

The tables in the Illinois Railroad Commissioners' Report are singularly devoid of the information which at this time would be most interesting in the State, especially in investigating the "extortionate profits" said to be made by the companies. There are tables of stock, and of funded and floating debt, but none of payments for dividends and interest, and so it is impossible to tell from the report what has been the income paid on the investments made in Illinois railroads. We see, however, that of the twenty-eight "classified companies" (including nearly all those having road in operation before last July) only eight made any dividends, and three of these have but a few miles of road in the State. The dividend-paying companies, however, had a little more than one-half of the mileage of the State. Calculating roughly the proportion of dividends for Illinois according to the mileage in that State, we find the aggregate dividends of the Illinois railroads, for the last year reported, to have been about $6,200,000; and, as their paid-in capital stock is $128,421,656, this is an average of less than 5 per cent. —the companies which divide 10 per cent. making up for those which divide nothing.

Probably on the whole the mileage in the State is somewhat more productive than that out of it; but while the Illinois Central and the Chicago & Northwestern earn much more per mile in Illinois than their average, all the Eastern lines must earn much less, as they have scarcely any local traffic in Illinois.

Of course dividends are not the final measure of profit; for a company's bonded debt might equal the value of its property, and it might expend a large net income in improvements and additions to its property, which would become profitable hereafter. It is, however, a notable fact, and one not well enough understood, that most of the Illinois railroads pay no dividends, and that all the dividend-paying lines have termini in Chicago. (A coal road which publishes no reports may be an exception.) Several lines, however, are likely very soon to be able to pay dividends, and some of them promise to become very profitable lines. So far, however, their income has been absorbed in interest payments and necessary improvements.

Another serious omisssion in the report is the total passenger and tonnage mileage, by which alone can we ascertain the average receipts for transporting a passenger or a ton of freight one mile. We have, however, the total mileage of trains, and dividing the aggregate receipts and expenses by this we have 88 per cent. as the average expenses and $1.34 as the average receipts per train mile. This includes working trains as well as those carrying traffic, however, and as the former are legitimately one of the expenses and add nothing directly to receipts, they should be excluded. If the column headed "other" (than passenger and freight trains) in the report includes only working trains, the traffic-train mileage was 27,493,784 miles, the earnings per train mile were $1.57 and the expenses $1.03. In Massachusetts, from much more accurate returns, the average cost per train mile is put at $1.31, and the average receipts at $1.81. Thus we seem to have net earnings of 54 cents per train mile in Illinois and 50 cents in Massachusetts, which of course is the income on the capital invested. The returns of "cost of road and equipment" show an investment equal to $8.04 per train mile, so the net receipts were a little less than 7 per cent. on the investment. The funded debt of the companies is equal to five-elevenths of the whole cost, and as the interest on this debt is probably on the average as much as 7½ per cent., average net earnings of 28 cents per train mile were necessary to save the companies from bankruptcy —leaving nothing to the stockholders. If these latter were to sacrifice one-half of their profits (whether divided or not), the traffic could have been carried at an average reduction of about 8 per cent., and where corn was carried for 12½ cents per bushel, it might have been carried for 11½.

The Value of Science to Railroad Men.

A late number of *Iron*—a new technical paper recently established in England—contains a very interesting article on this question, with some comments on the discussion at the last Convention of the Master Mechanics' Association on the use of steel. The writer says:

"No engineering question is, at this moment, more vaguely defined than the subject of this article. The evidence of various authorities, any one of whom is entitled individually to respect, is so conflicting, the circumstances under which their experience has been derived vary so much, that now, in spite of all that the Bessemer process has done for the manufacture, not simply of steel, but for all those intermediate grades which occupy the debatable ground of semi-steel, mild steel, etc., the great question, of where it is best to use steel, and where iron is the preferable material, appears almost as far from definite solution as it was twenty years ago. * * * * *

"Last June a very interesting discussion on the report of a committee on Boilers and Boiler Materials took place at Boston, U. S., and some of the statements made by the various master mechanics, to their Association, bear directly on this subject."

After giving an abstract of the discussion referred to, the writer says:

"We fail in the endeavor to arrive at some tangible result of the discussion, which seems altogether inconclusive as to the merits of steel as compared with iron in boilers, more particularly for furnace-plates. All the speakers came from widely different districts, and their several experiences were gained under circumstances of the most diverse description. If the discussion teaches anything at all, it is that the mere collection of disjointed experiences, gained without systematic observation, is almost valueless. For example, in no case was there a complete history given, from the ore to the end of the career of a single plate, either steel or iron; we find no analysis of any plate; and no conception can be formed of the percentage of carbon, or sulphur, or of phosphorus, that was present; no analysis of the fuel is given, nor record of the constituents of the water used in any single instance. When scientific societies will fairly investigate a matter of such importance in a systematic and connected manner, reliable and complete evidence may be forthcoming; but not otherwise.

"In regard to the future of steel boilers, while certainly the tendency is still in favor of steel, yet the superior reliability of iron enables it to maintain its ground. But, in fact, we gather from most of the evidence before the public at present that no definite verdict can as yet be returned in favor of steel or iron. We require to know experimentally what are the constituents, and their proportions, in the case of each material, that answer best with defined particulars of fuel, water, steam pressure and modes of putting the plates together. Let these conditions be fairly settled, and then it may be possible to decide this very important question in some satisfactory way. In the discussion referred to, being recent, all the speakers were thoroughly practical men. Their experiences covered a wide range of conditions, and they employed both American and English materials of all brands; and yet no useful and practical conclusion can be drawn therefrom."

We have frequently called attention to the profit which must result from the application of a higher order of scientific training to railroad operation. There is something very depressing about the total indifference which the majority of railroad managers manifest with regard to the qualifications of the persons whom they place in charge of their machinery, road and other departments. We think we may safely state that in a large majority of cases, when a candidate offers himself for any of these positions, such a thing as inquiring into his scientific attainments never occurs to those who have the appointing power. We have before us now a letter received recently from one of the most intelligent master mechanics we know, who is young and ambitious. He is entirely self-educated, but wide-awake to every practical application of science or knowledge to the operation of railroad machinery. He writes: "Good men are not paid enough, and for this reason they are driven to seek more lucrative positions. I must say that I feel that way myself, and I am now giving my leisure time to the study of higher branches of railroading. I must either have more money for the service I am now performing or I shall seek another position. I like the machinery department best: it is my *forte*; but I am poor and must look for a business that will pay me better." That many others occupying similar positions feel as our correspondent does, we know from personal intercourse with them. That a policy which drives the most intelligent men out of the employ of companies whose business is more complicated, and which requires a greater amount and more varied knowledge than that of almost any private manufacturing establishment, seems to be a very unwise one.

There is, of course, another side to this question, which is very forcibly stated in the same paper from which we have already quoted. In discussing the management of iron works, Mr. W. Mathieu Williams says:

"Why is it that even at the present day, when all admit the value of science in its applications to manufactures, we still hear so many complaints of opposition and prejudice against scientific improvements and improvers? Does it all arise from ignorance among practical men, or is there something else underneath that is not quite so visible to outsiders? There was a time when I should pretty confidently have answered this question by attributing all to ignorance; when, had I seen a black-faced perspiring puddler sneering at the learned suggestions of a well-dressed and courteous university professor, I should, without further inquiry, have concluded at once that all the ignorance was on the puddler's side, and all the science resided with the professor; but subsequent experience behind the scenes of iron works, etc., has taught me some rather unpalatable lessons in this direction; has shown me that in many cases the scientific gentleman, paying a patronizing visit to the puddler's furnace, and making his patronizing expositions and suggestions, may really be talking arrant nonsense, the shallowness of which the illiterate puddler perfectly understands and appreciates, although unable to refute in learned phrase. Such displays of learned ignorance are far more common than most people suppose, and I suspect that they occur more frequently in ironworks than anywhere else; at any rate, it is there that they have most commonly come under my own observation.

"It is not at all surprising, then, that the puddler, or other workman, who has witnessed a few of such exhibitions either in the form of verbal disquisitions, or of so-called practical experiments, should acquire a prejudice against all sort of 'schemers' and 'theorists,' as he calls them, and should become very sceptical concerning the application of science to his own business.

"This scepticism and opposition is not likely to be removed by sending raw university men to teach the technical bearings of science to shrewd artisans. A man who has merely gone through the course of study necessary for the acquisition of his university degrees and honors, however high, has merely completed one-half of his education, as far as *experimental* or practical science is concerned; and if he imagines otherwise, he is likely to make such a display of his ignorance of the other half as will lead his artisan pupils to despise his teaching altogether."

That some railroad companies have had experience somewhat similar to that indicated by what Mr. Williams has written, we know quite well; but it only proves that education is not completed when the university degrees and honors are conferred. Of the two, the practical experience is much the most important qualification in the management of railroads, but the two *combined* are what is needed, and *either* one without the other is only the half of an education.

Railroad Speed in England.

The Engineer gives the following rates of speed attained by the express trains of nine of the larger companies having their termini in London. The writer says that no doubt it would be possible to show that other companies run trains as fast or faster. The speeds given are from the time-tables of the companies, and may therefore be regarded as reliable. The mean averages given are determined by taking the total time occupied in running the total of the distances shown, and dividing the latter by the number of hours occupied by the journey. The fastest speed is that made between two stations only:

Name of Road.	Total distance (miles)	Mean average in miles per hour	Maximum average speed in miles per hour between stations	Distances between the stations referred to
Great Western	184	51	53½	77¼
London, Brighton & South Coast	162¾	45¾	47½	40¼
Great Northern	274½	45½	51	76¾
London, Chatham & Dover	175¼	44¼	47½	43½
Southeastern	195¾	43¾	51¾	26½
Northwestern	481¾	42½	45½	75½
Midland	206	41¾	44½	21¾
Southwestern	297¾	40¾	43¾	40¾
Great Eastern	115	37¼	41	25¼

It will be seen that the time of the Great Western Company, which is an average of 53¼ miles per hour in a run of 77¼ miles, is the fastest given. This, the writer from whom we glean these facts says, "is no doubt the fastest running to be found anywhere, even for the shortest distances, the 'lightning-expresses' of America included."

He further says: "The examples of runs of 50 miles and upward without stopping are numerous. The continental trains of the London, Chatham & Dover run from Herne Hill to Dover, a distance of 74 miles, without stopping; and the Southeastern, between Cannon street and Dover, 75½ miles. The Great Western run from Paddington to Swindon, 77¼ miles, without stoppage; the Great Northern from London to Peterboro, and from Grantham to York, 76¼ and 84¼ miles respectively; while the London & Northwestern Company's Irish mails run from Chester to Holyhead, a distance of 85¼ miles, occupying 2 hours and 7 minutes in the journey, without stopping, being the longest run recorded."

From the various examples we have quoted, it will be perceived that the oft-mentioned "mile-a-minute" speed is, to say the least, somewhat apocryphal. A few of the above-mentioned trains may at times attain such an extreme velocity, but it can only be on some unusually favorable bit of road, and maintained at the most for a few minutes only. There is the best evidence for stating that such a speed is scarcely ever exceeded, and that sufficient time is always allowed for even the fastest trains to perform their journey to time, without approaching nearer than by several miles an hour to such a fancy velocity.

Record of New Railroad Construction.

This number of the Railroad Gazette has information of the completion of track on new railroads, as follows:

Port Royal.—Completed between Port Royal, S. C., and Augusta, Ga., by the laying of 17 miles of track in South Carolina.

Cairo & St. Louis.—This 3-feet gauge road has been extended southward 7 miles to Red Bud, Ill.

This is a total of 24 miles of new railroad.

The Cost of the Revere Accident to the Eastern Railroad Company that corporation reports to have been $434,781.88, nearly all claims having been settled. This is a sermon on the subject which stockholders at least ought to find very impressive, as the amount was about 11 per cent. on their stock. Although this is perhaps the largest amount ever paid out on account of a single accident, it only illustrates the bad economy of a policy which does without the best machinery and appliances, and postpones needed repairs (and, we might say, is unwilling to pay for the best ability in officers), in order to save money. All the improvements the Eastern has made since the Revere accident, intended to make the road safer, cannot have cost it nearly so much as this one accident. A great many companies have similar lessons, only not quite so harsh, but some of them seem very slow to understand them.

Report of the Chicago & Alton Railroad Company.

The company has rendered its report for the year 1872, being the tenth annual report. The lines operated by this company at the close of the year 1872 were:

Chicago to Joliet (under perpetual lease)	38
Joliet to East St. Louis (owned)	242
Dwight to Washington, with branch to Lacon (owned)	79.8
Bloomington to Godfrey—St. Louis, Jacksonville & Chicago Railroad (perpetual lease)	120.6
Roodhouse to Louisiana (owned)	37.6
Louisiana to Jefferson City—Louisiana & Missouri River Railroad (under perpetual lease)	101.1
Total miles	649.1

On the "main line" between Chicago and East St. Louis there is 30½ miles of double main track and 61¾ miles of side tracks. On the several other lines the aggregate length of side track is 26.65 miles, making a total on all the lines of 88¼ miles of side tracks. That part of the Louisiana & Missouri River road between Louisiana and Mexico (on the line of the St. Louis, Kansas City & Northern Railway) was open for traffic at the commencement of the year. The line from Mexico to Fulton, 24½ miles, was opened for traffic March 6, and the line from Fulton to Jefferson City, 25½ miles, July 16, 1872.

The average mileage worked during the year was 631 miles, against 525¾ miles in 1871.

The equipment at the close of the year consisted of 144 locomotives (131 coal-burners and 13 wood-burners), 19 of which were purchased during the year from the Schenectady Locomotive Works. The car stock on the road at the same time consisted of 12 Pullman palace sleeping cars, 5 Pullman dining cars, 57 passenger coaches, 4 baggage cars, 9 baggage and mail cars, 3 baggage and express cars, 8 express cars, 1,614 house freight cars, 151 combination (house and stock) cars, 397 stock cars, 739 platform cars, 11 drovers' cars, 1 paymaster's car, 7 tool and wrecking cars.

Six first-class coaches, 2 baggage cars, 200 box cars, 100 stock cars, 100 platform cars, 46 combination cars, 4 drovers' cars, 1 tool car and 1 wrecking car were constructed at the shops of the company and added to the car equipment. One paymaster's car, 20 house cars and 20 platform cars were constructed to replace cars burned at the Chicago fire.

This property was represented by the following:

CAPITAL STOCK.

Common	$8,929,900	
Preferred	2,425,400	
		$11,355,300

BONDS AND OTHER OBLIGATIONS.

Preferred sinking fund bonds	$199 000	
First-mortgage bonds	2,383 000	
Income bonds	1,087,000	
		3,669,000
First and second-mortgage bonds issued by the St. Louis, Jacksonville & Chicago Railroad Co., on line between Roodhouse and Louisiana, payment of principal and interest assumed by this company, as per terms of sale of road		752,000
Common stock sold in pursuance of consent of stockholders given in response to circular dated April 15, 1872, to be issued and delivered September 1, 1875		995,600
		$16,771,900

EARNINGS.

	1872.	1871.
From passenger traffic	$1,329,714 83	$1,273 793 44
From freight traffic	3,607,642 90	3,740 203 07
From express companies	94.868 65	84.919 42
From transporting U. S. mails	77,171 64	74.020 51
From miscellaneous sources	46,927 69	105,913 76
	$5,156,325 71	$5,278,910 23

EXPENSES.

For conducting transportation	$902,508 95	$722,652 30
For motive power	910.273 49	829,898 56
For maintenance of way	861,575 64	976 819 18
For maintenance of cars	335.214 83	300,163 02
For general expenses	133,747 01	133,533 74
For taxes, State, county and municipal	128,858 30	117,757 97
Total	$3,277 178 27	$3 080,824 77
Net earnings	$1,879,147 44	$2,198,085 46

The surplus of $446,955 81 at the close of 1871 swelled the income account to $2,326,103.25.

The disbursements were:

Interest on bonds of all classes	$299,224 78	
Interest on scrip convertible September 1, 1875	9,431 37	
Paid sinking funds	82,000 00	
Rental paid Joliet & Chicago Railroad Co., exclusive of sinking fund	133 736 65	
Rental paid St. Louis, Jacksonville & Chicago Railroad Co	240,000 00	
Rental paid Louisiana & Mo. River Railroad Co	112,454 17	
Dividends, Nos. 18 and 19	1,135,000 00	
Government tax on dividends, &c	10,403 13	
		$2,022,330 10
Balance, December 31, 1872		$303,773 15

These disbursements were therefore $143,183 in excess of the net earnings.

IMPROVEMENT ACCOUNT.

In pursuance of the terms proposed in a circular addressed to the stockholders of the company, under date of April 15, 1872, 9,956 shares of the common stock of the company were sold at par to stockholders of record, on the 6th day of May ensuing, in the proportion of one share to each ten shares held on that day. Payment for the same was made by installments June 1, August 1, and September 2. At the date last named, scrip was issued, bearing interest at 7 per cent. per annum, payable semi-annually, and convertible into common stock September 1, 1875.

The amount received for this special account (interest having been adjusted at 7 per cent. per annum) was	$995,630 41
There has been expended during the year for locomotives, cars, buildings and other additions to the property of the company	962,534 62
Balance	$33,095 79

The gross receipts from traffic were $122,584.52, or about 2 3-10 per cent. less than those of the preceding year. The net receipts were $318,938.02, or about 14½ per cent. less than those of the preceding year. The gross receipts were at the rate of $8,172 per mile in 1872 and $10,040 per mile in 1871; and the net receipts were $2,978 in 1872 and $4,181 in 1871.

The working expenses (exclusive of taxes) amounted to 61 per cent. of gross receipts; including taxes 63 6-10 per cent. During 1871 the operating expenses were 56 13-100 and 58 36-100 per cent. respectively.

This increase in expenses and decrease in earnings are thus explained by the President:

"The causes that have produced this unsatisfactory result, may be mainly traced to the 'Chicago Fire,' and are, therefore, exceptional. During the greater part of the year, owing to the destruction of warehouses, it was impossible to obtain storage for grain arriving at Chicago on your line, without resorting to very expensive expedients, the cost of which was charged in the account of operating expenses. For a considerable portion of the year storage could not be had at any cost. Traffic in grain to Chicago ceased, and was forced by different channels to other markets.

"The transportation of grain and lumber comprise the most important part of the traffic on your lines, and the measure of the latter is determined by the amount of the former to a very great degree; for the reason that the farmer generally makes his purchases of lumber with the proceeds of, and at the place where he finds a market for, his grain. With a much larger amount of grain in the country than during the preceding year, the amount shipped to Chicago over your line was reduced 1,500,000 of bushels, and the return freights in lumber were reduced nearly 80,000,000 of feet.

"At nearly every important station on your line we have competition by other railways for eastern-bound traffic, and the through rates are thereby very much reduced. Under ordinary circumstances the comparatively low cost of lake and canal transportation, of which we take advantage during the season of navigation in forwarding freight to the Atlantic cities, enables us to obtain fair rates upon our part of the through route; but during the past year the capacity of the lake vessels was found to be quite inadequate to meet, in addition to the ordinary demands, the very extraordinary one for transporting materials for the rebuilding of Chicago. The result was an advance of from 200 to 300 per cent. in lake freights, which compelled us to accept very much less than our usual proportion of the through rate.

"There has been expended during the year $83,284.54 in replacing or in paying for property destroyed at the Chicago fire, and not covered by insurance. That sum has also been charged in the accounts of operating expenses.

"On lines like yours, where very few persons travel except on business, a reduction of freight traffic from any cause, reduces the passenger traffic also in some degree. Other causes, however, such as the general increase of population and business of the country, have resulted in more than balancing the reduction, and the receipts for the year show an increase of $55,-921.39, or 4 4-10 per cent. The number of passengers transported during the year was 772,506, an increase of about 8 per cent. over the preceding year. Of the whole number 5½ per cent. were through passengers, and 94½ per cent. way passengers."

The tonnage carried, though 6.88 per cent. greater than in 1871, produced 3½ per cent. less earnings, owing to reduced rates. The aggregate carried was 3,203,597,161 pounds, including 486,-000 tons of coal. The coal traffic was greater by 25½ per cent. Of the entire tonnage, 11.26 per cent. was through and 88.74 local freight.

The property has been kept in condition equal to any in the West, and 2,500 tons of steel rails, 4,823 tons of new and re-rolled iron rails, 108 tons of spikes, 200 tons of splices and bolts, and 176,662 cross-ties were used in repairs and renewals of track during the year, and side-tracks measuring 10½ miles in the aggregate were constructed. Other new constructions were the building for general offices in Chicago, 15 new stations, 2 engine houses, 11 water stations, etc.

The cost of motive power per mile run was 22.11 in 1872 against 23.69 in 1871, a decrease of 1.58 cents per mile.

The fuel consumed amounted to 89,084 tons of coal and 14,-968 cords of wood, and the average distance run was 40 miles per ton of coal and 42 miles per cord of wood. The mileage of locomotives was 3,902,102—16 per cent greater than in 1871.

The traffic brought by the leased Jacksonville Division to the main line during the year amounted to $495,414.70.

During the three winter months, the ice blockade at the Louisiana ferry pretty much cut off traffic in connection with the Louisiana & Missouri River Railroad. For the rest of the season, 19,699 cars, or an average of 84 daily, crossed the river. The cost of the ferry for the year was $75,300, and the revenue from the cars which passed, computed at the rates of the Quincy bridge, would have been $82,360. The necessity of a bridge is urged, and the present traffic is believed to be sufficient to meet the interest on the cost of one, at no greater tax than that required by the ferry. Estimates made indicate that one can be built of stone and iron for considerably less than $1,000,000.

The traffic on the 50 miles between Chicago and Wilmington (over which most of the coal traffic is conducted) has reached the utmost amount that can be safely conducted on a single track, and, as it is constantly increasing, it will be necessary to lay a second track this year. The cost of such a track laid with steel is estimated at $950,000.

CHICAGO RAILROAD NEWS.

Michigan Central.

The freight embargo at Detroit has been entirely removed, the Michigan Central loaning 14 of its engines and a large number of its cars to the Great Western Company to enable the latter to carry off the accumulated freight on the Canada shore. The Jackson, Lansing & Saginaw Division, now completed to Otsego Lake, is to be extended 50 miles to Lake Huron, at the mouth of the Sheboygan River (about 20 miles southeast of Mackinaw City), next summer. The route north of Saginaw lies through a dense pine forest for almost the entire distance, and saw mills are erected along the line as fast as it is opened.

Chicago & Northwestern.

The time table of the La Crosse, Trempealeau & Prescott, and Madison Extension roads, which took effect February 16, shows trains running from Elroy to Camp Douglas Junction, 13 miles, over the West Wisconsin road, from Camp Douglas to Sparta Junction, 28 miles, over the La Crosse Division of the Milwaukee & St. Paul, from Sparta to Winona Junction, 23 miles, over the new line of the Northwestern, and from Winona Junction to Winona, 30 miles, over the La Crosse, Trempealeau & Prescott. The trains of the Milwaukee & St. Paul road use the same line from Camp Douglas Junction to Sparta Junction, and from Winona Junction to Winona.

Chicago, Burlington & Quincy

This company will have 500 new cars on the first day of April, part of which are being constructed at the manufactory of Wells, French & Co., of Chicago. The company have just received the last installment of 30 new engines for the past year. It now owns 216 engines, exclusive of those on leased lines. The company have just ordered six new switching engines.

Chicago & Pacific.

Mr. Dobbins has recently returned from the East, where, it is understood, he has made ample arrangements for putting the road on a good financial basis. Two new locomotives have been added to the stock of the road, and a considerable number of freight and passenger cars are in process of construction in Michigan City.

PERSONAL.

—Mr. Milton Sessions, of St. Albans, Vt., who has for a long time been Master Car Builder of the Vermont Central Railroad, has resigned that position to become Superintendent and General Manager of the Taunton Car Company, at Taunton, Mass.

—Mr. Wilson Eddy, Master Mechanic of the Boston & Albany Railroad, was recently presented with a handsome astronomical clock, valued at $250, by the employees of the road.

General Railroad News.

ELECTIONS AND APPOINTMENTS.

—Mr. W. C. Thompson, for about two years Assistant General Passenger Agent of the Union Pacific Railroad, has been sent to London by the Union and Central Pacific as their "General Foreign Agent," having his office, we believe, at No. 22 Moorgate street.

—Mr. James Anderson, General Superintendent of the Wilmington, Columbia & Augusta Railroad, has been appointed also General Superintendent of the Charlotte, Columbia & Augusta road.

—Mr. John S. Farlow has been chosen Vice-President of the Cincinnati, Sandusky & Cleveland Railroad Company.

—Mr. Elisha Atkins has been chosen President of the Little Rock & Fort Smith Railroad Company in place of C. G. Scott. J. M. Cummings has been chosen Treasurer in place of E. L. Adams; George Everett, Managing Director; and S. B. Beaumont, General Superintendent in place of Asa Hodges.

—Samuel McD. Tate has been chosen President of the Western Railroad Company of North Carolina, in place of L. C. Jones; G. P. Erwin has been chosen Treasurer in place of W. A. Stedman; H. C. Cowles, Secretary; and A. Colman, Chief Engineer.

—Ransom Gardner is President, C. Cowgill, Vice-President, E. W. N. Ellis, Secretary, J. H. Defrees, Treasurer, T. J. Wells, General Superintendent, and J. E. Benhem, General Freight and Ticket Agent of the Cincinnati, Wabash & Michigan Railroad Company.

—At the annual meeting of the stockholders of the Cincinnati & Springfield Railroad Company, at Cincinnati, February 26, the following directors were chosen for the ensuing year: R. M. Shoemaker, Glendale, O.; Robert H. Shoemaker, Seth Evans, Oscar Townsend, J. H. Devereux, H. B. Hurlbut, Cleveland, O.; Rush R. Sloan, Sandusky, O.; J. N. Kinney, Cincinnati, O. Messrs. Hurlbut and R. H. Shoemaker are new directors, taking the place of Horace F. Clark, of New York, and Selah Chamberlain, of Cleveland.

—At the annual meeting of the Utica, Chenango & Cortland Railroad Company, at Cortland, N. Y., recently, the following officers were elected; David B. Parce, of Otselic, N. Y., Henry R. Randall and N. P. Hitchcock, of Pitcher, N. Y., directors; Allen B. Smith, of Cortland, President; D. B. Parce, Vice-President; Norman Chamberlain, of Cortland, Treasurer; Frank Place, Secretary, and Horatio Ballard, Attorney.

—Mr. S. Woodward has been appointed General Superintendent of the Indianapolis & St. Louis Railroad, in place of O. S. Pease, resigned.

—Mr. O. W. Cooke has been appointed Auditor of Traffic Receipts; A. B. Proal, Auditor of Disbursements; and J. S. Hunichen, General Accountant of the Erie Railway.

—Mr. D. E. Culver has been chosen Vice-President of the New York & Oswego Midland Railroad Company, in place of Hon. E. P. Wheeler, resigned. Mr. John R. Clarke has been appointed Treasurer, in place of D. L. Follett, who has been Acting Treasurer since the death of Mr. Walter L. Conkey.

—Mr. B. E. Smith has been chosen President of the Missouri, Iowa & Nebraska Railroad Company, in place of M. F. Drake.

—Mr. J. E. Wooten, late Assistant Superintendent and Engineer of Machinery, has been appointed General Superintendent of the Philadelphia & Reading Railroad, in place of G. A. Nicholls, chosen Second Vice-President. Mr. L. B. Paxon, late Master Machinist at Reading, has been appointed Engineer of Machinery. Mr. J. B. White, late Assistant Comptroller, has been appointed Comptroller, in place of David J. Brown, appointed Secretary. Dr. D. Jones, late First Auditor, becomes Assistant Comptroller, and John Heebner is appointed First Auditor.

—Mr. J. C. Reinhart has been appointed Superintendent of the Catawissa & Williamsport Branch of the Philadelphia & Reading Railroad.

—Mr. F. S. Leonard has been appointed Assistant Superintendent of the Southern Division, and Mr. T. J. Carlile, Assistant Superintendent of the Northern Division of the Alabama & Chattanooga Railroad.

—Mr. C. R. Thomas has been chosen President of the Atlantic & North Carolina Railroad Company, in place of Hon. E. R. Stanley.

—Mr. H. J. Heyden has been appointed General Freight Agent of the Boston & Albany Railroad.

—Mr. George S. Frink has been appointed Cashier of the Connecticut Western Railroad, in place of C. Burrall, resigned.

—Mr. W. W. Barnes has been appointed General Superintendent of the East Alabama & Cincinnati Railroad, in place of R. A. Hardaway.

—Mr. F. H. Harris has been appointed Chief Engineer of the North & South Railroad of Georgia, in place of W. J. Winn.

—Mr. P. B. Groat, long of the Hannibal & St. Joseph Railroad, has been appointed General Ticket Agent of the St. Louis, Kansas City & Northern Railway.

—Mr. E. J. Brooks has been appointed General Freight and Ticket Agent of the Louisville, New Albany & Chicago Railroad, in place of T. W. Armstrong, General Freight, and S. K. Hooper, General Ticket Agent.

—Mr. James Salisbury has been appointed Master Mechanic of the Huntington & Broad Top Railroad, in place of J. Caffrey. Mr. B. A. Knight has been appointed Purchasing Agent of the same road.

A circular from the President of the Canada Southern Railway Company announces that at a meeting of the board of directors, held February 17, 1873, Mr. F. N. Finney, heretofore Chief Engineer and Superintendent of the road, was appointed General Superintendent.

—At a meeting held at Elkton, Md., February 25, the stockholders of the Elkton & Massey's Railroad Company organized by the choice of Hon. Jacob Tome, of Port Deposit, Md., as President, and Dr. Mackall, J. Peach, J. C. Price, W. M. Knight, G. Biddle, Sewell Green, of Delaware; and Alexander Wilson, of Kent County, Md., as directors.

—Mr. Thomas H. Doyle has been appointed Superintendent of the Osage Division of the Missouri, Kansas & Texas Railway. Mr. Doyle has been a conductor on the road.

—Mr. Robert W. Geiger has been appointed General Manager of the Continental Fast Freight Line.

—Mr. John P. Usher has been chosen President of the Lawrence & Southwestern Railroad Company, in place of J. W. McMillan.

—The annual meeting of the Maine Central Railroad Company was held at Augusta, Me., February 26, and the following board of directors elected: Richard D. Rice, Darius Alden, of Augusta, Me.; John B. Brown, Horatio N. Jose, Lewis Pierce, of Portland, Me.; Abner Coburn, of Skowhegan, Me.; Noah Woods, L. Strickland, of Bangor, Me.; George M. Patten, of Bath, Me.; Anson P. Morrill, of Redfield, Me.; George L. Ward, of Boston, Mass. Messrs. Pierce and Woods are new directors, replacing R. B. Dunn and A. D. Lockwood, who declined re-election. Richard D. Rice was re-elected President, Anson P. Morrill Vice-President, and Josiah H. Drummond Clerk. It had been reported previously to the election that the Eastern

Railroad Company had secured a controlling interest in the stock and that an entirely new board would be chosen, but the changes made are unimportant.

—Mr. C. P. Johnson, for two years past Train Master of the St. Louis & Southeastern Railway, resigned March 1. A correspondent says: "Mr. Johnson has been connected with this road ever since it opened for business, and his management of the transportation department has been a success. He leaves the road to engage in other business, and carries with him the regrets of the employees of the road generally." Mr. D. C. Rice, of the Vandalia Line, succeeds Mr. Johnson.

—At the annual meeting of the Lehigh Coal & Navigation Company, at Philadelphia, February 26, E. W. Clark was re-elected President, and the old board of directors was re-elected as follows: Francis R. Cope, Francis C. Yarnall, George F. Tyler, Philip C. Garrett, Charles Wheeler, George Whitney, Alexander Biddle, Samuel Thomas, Philadelphia, Pa.; Fisher Hazard, John Leisenring, Mauch Chunk, Pa.; and Charles Parrish, Wilkesbarre, Pa.

—Mr. John C. Short, of Danville, Ill., has been chosen President of the Paris & Danville Railroad Company, in place of Hiram Sandford.

—Mr. R. P. Woolsey, who for seventeen years has been Train Dispatcher on the Illinois Central Railroad in Chicago, has resigned his position in order to accept the superintendency of telegraph lines on the Indianapolis & St. Louis Railroad. Mr. D. S. Bailey, of Champaign, takes his place in Chicago.

—At the annual meeting of the stockholders of the Northern Central Railway Company, held in Baltimore, February 26, the following board of directors was elected: William Calder, Harrisburg, Pa.; A. E. Kapp, Northumberland, Pa.; Thomas A. Scott, Edward C. Biddle, John M. Kennedy, Jacob P. Jones, Wistar Morris, Strickland Kneass, Philadelphia, Pa.; Henry Welsh, York, Pa.; Benjamin F. Newcomer, George Small and Samuel M. Shoemaker, Baltimore, Md. The only change is the substitution of the name of Strickland Kneass for Edmund Smith. J. D. Cameron was re-elected President, J. N. Du Barry, Vice-President, and R. S. Hollins, Secretary.

—Mr. John Kilkeny has been appointed General Traveling Passenger Agent of the Louisville, Cincinnati & Lexington Railroad.

—Mr. E. R. Rather has been appointed Auditor of the Memphis & Charleston Railroad, in place of C. L. Anderson, resigned.

—John H. Perry has been appointed General Ticket Agent of the Memphis & Little Rock Railroad.

—Mr. M. G. Moist has been appointed Superintendent of the Memphis, Carthage & Northwestern Railroad, in place of G. A. Burt.

—Mr. H. G. Onderdonk has been chosen President of the Wilmington, Charlotte & Rutherford Railroad Company, in place of S. N. Martin.

—At the annual meeting of the stockholders of the Springfield & Illinois Southeastern Railway Company, held at Springfield, Illinois, February 26, the following board of directors was elected: Thomas S. Ridgeway, Charles Carroll, Shawneetown, Ill.; Alexander Starne, F. W. Tracy, George N. Black, George W. Norris, Springfield, Ill.; C. A. Beecher, Fairfield, Ill.; H. R. Huribut, T. P. Handy, Oscar Townsend, L. M. Hubby, Cleveland, O.; E. C. Dawes, Cincinnati, O.; M. H. Bloodgood, New York. The only change made was in the substitution of L. M. Hubby for William Collins, of Cleveland. The board subsequently re-elected Thomas S. Ridgeway, President; C. A. Beecher, Vice-President; M. H. Bloodgood, Treasurer, and George N. Black, Secretary.

—The stockholders of the Chicago & Pacific Railroad Company have elected the following named gentlemen directors for the ensuing year: T. S. Dobbins, R. M. Hough, W. L. Pease, George Youngs, John S. Wilcox, George S. Bowen, W. B. Howard. The officers were elected on the 14th ult., as follows: T. S. Dobbins, President; George S. Bowen, Vice-President and Treasurer; W. T. Hughes, Secretary; J. S. Wilcox, Solicitor.

TRAFFIC AND EARNINGS.

—The earnings of the Erie Railway for the week ending February 23 were: 1873, $340,484; 1872, $323,514; increase, $16,970, or 5¼ per cent.

—The earnings of the Louisville & Nashville Railroad for the month of January were: 1873, $477,200; 1872, $401,064; increase, $76,136, or 19 per cent.

—The earnings of the St. Louis & Southeastern Railway (consolidated) for the third week in February were $23,088.87. The earnings of the St. Louis Division for the same week were: 1873, $14,022.04; 1872, $11,787.35; increase, $2,234.69, or 19 per cent.

—The earnings of the Kansas Pacific Railway for the third week in February were: from passengers, $20,770.20; freight, $27,810.27; mails, $2,055.31; total, $50,635.78. Of this amount, $3,438 was for transportation of troops, mails and government freight.

—The earnings of the Dorchester & Delaware Railroad for the year 1872 were $22,791.89; the operating expenses, $15,616.64, or 68½ per cent. of the earnings, and the net earnings, $7,175.25. The increase in gross earnings over the preceding year was $1,312.17, or 6½ per cent. The earnings were at the rate of $691 per mile. The road is 33 miles long, and its principal traffic is in fruits, vegetables and other market products.

—The earnings and expenses of the Northern Central Railway for the year 1872 were as follows:

Gross earnings	$4,598,820 19
Expenses (74¾ per cent. of earnings)	3,437,050 97
Net earnings	$1,161,769 22

—The receipts of the Grand Trunk Railway of Canada for the week ending February 8 were: 1873, £30,500; 1872, £32,800; decrease, £2,300, or 7 per cent.

—The receipts of the Great Western Railway of Canada for the week ending February 7 were: 1873, £21,314; 1872, £16,674; increase, £4,640, or 27 5-6 per cent.

OLD AND NEW ROADS.

Connecticut Central.

The contract for building this road from East Hartford, Conn., to the State line near Springfield, Mass., has been let to Willis, Phelps & Co., of Springfield. The distance is 20 miles and the contract price is about $25,000 per mile.

Massachusetts Central.

Plans are being matured for the construction of a branch line from Amherst, Mass., north to Turner's Falls, on the Vermont & Massachusetts, a distance of about 15 miles. The line would be parallel to and not far from that of the New London Northern road.

Indiana South & North.

The directors of this company have decided to issue bonds on the road in three divisions, as follows: The Northern Division from Brazil, Ind., north to a junction with the Cincinnati, Lafayette & Chicago road near Orwell, a distance of 85 miles. Of this division, 15 miles, from Attica to Veeder's, on the Indianapolis, Bloomington & Western, is completed, and the company hopes to build 35 miles more during the coming season. The Center Division will extend from Brazil south to Bloomfield, in Greene County, 40 miles. It is intended to commence work on this section in the spring. The Southern Division will extend from Bloomfield south to Newbury, on the Ohio River.

Corning, Cowanesque & Antrim.

This is the name of a new company formed by the consolidation of the Blossburg & Corning, whose road extends from Corning, N. Y., south to Lawrenceville on the Pennsylvania State line, 15 miles, and the Wellsboro & Lawrenceville, whose road runs from Lawrenceville southwest to Antrim, Pa., 37 miles, making the consolidated line 52 miles long. Both roads have been for some time leased by the Fall Brook Coal Company, and will continue, as heretofore, to be operated in connection with the Tioga Railroad, which extends from Lawrenceville south 33 miles to Fall Brook, Pa. The roads are used mainly for coal traffic.

Port Royal.

The last rail was laid on this road February 28, and the line is now complete from Port Royal, S. C., to Augusta, Ga., a distance of 110 miles. Its coast terminus has one of the few deep-water harbors south of New York—very much better than those at Charleston and Savannah, to both of which, however, the Port Royal Railroad can give an outlet through the Charleston and Savannah Railroad, which it crosses 20 miles from Beaufort. It affords a direct outlet for the Georgia Railroad and the lines with which it connects.

Mississippi Valley & Western.

Quincy papers say that this company has succeeded in negotiating the new bonds of the consolidated company and have purchased iron for the extension to St. Louis.

Natick & Sherborn.

A company by this name has been formed to build a railroad from Natick, Mass., south to Dowse's Corner, on the Framingham and Mansfield road, a distance of about three miles.

St. Louis to Omaha.

The St. Louis, Kansas City & Northern Company now runs a through passenger train, with Pullman sleeping cars, between St. Louis and Omaha, connecting with the Union Pacific for San Francisco. This train leaves St. Louis at 8:30 a. m., and for the latter part of the route passes over the Kansas City, St. Joseph & Council Bluffs Railroad.

Northern Central.

At the annual meeting of this company in Baltimore, February 27, the board of directors recommended that the road be leased to or absorbed by the Pennsylvania Railroad Company, provided it could be done on an equitable basis. The matter was referred to a committee which is to report to an adjourned meeting of the stockholders. It is understood that negotiations have been going on for some time, the principal difference being as to the rate of interest to be paid on the stock by the lessees. The Pennsylvania Railroad Company has for some time held the controlling interest in the stock, but, it is said, now desires to acquire complete control by lease, in order to facilitate arrangements for the traffic of the Philadelphia & Erie road, which passes over the Northern Central from Harrisburg to Sunbury.

There is said to be much opposition to the lease among the stockholders, and after the adjournment of the annual meeting one of them obtained an injunction restraining the directors from taking action towards leasing the road.

The road extends from Baltimore, Md., through Harrisburg, Pa., to Sunbury, 138 miles, with an extension from the depot in Baltimore to the wharves at Canton, four miles. The Shamokin Valley & Pottsville Railroad, from Sunbury to Mt. Carmel, 28 miles; the Elmira & Williamsport road from Williamsport to Elmira, N. Y., 78 miles; the Chemung Railroad, from Elmira to Watkins, 22 miles, and the Elmira & Canandaigua road, from Watkins to Canandaigua, 47 miles, are operated under lease, making in all 317 miles operated. By the last published annual report, that for 1871, the capital stock was $5,601,700, the funded debt $7,718,602.09 and the floating debt $1,006,849.89. The dividends paid for the last two years have been 6 per cent annually.

New York & Philadelphia.

The bill granting a charter to this company, which is in fact the National Railway Company, came up on its third reading in the New Jersey Senate (having previously passed the lower House), and, after a long and exciting debate, failed to pass, the vote being 11 against to 10 for the bill. This probably puts an end to the prospect of the passage of any through railroad bill this session, as it seems to be decided that a majority of the Senate will not vote against the Pennsylvania Railroad Company, and it is certain that the lower House will pass no bill which is even suspected of being in the interest of that company.

Long Island.

Surveys are being made for an extension of the Port Jefferson Branch, from Port Jefferson east to the main line at Riverhead, a distance of about 20 miles.

Athol & Enfield.

The directors of this company have accepted the supplement to the charter recently passed by the Massachusetts Legislature, which changes the name of the company to Springfield, Athol & Northwestern, and authorizes the increase of the capital stock to $850,000.

Boston, Barre & Gardner.

The route by which the extension of this road will enter Winchendon has been finally located. It will cross the Cheshire Railroad above Prentiss Bridge, and run thence parallel to that road, crossing the village streets at grade, to the depot of the Monadnock Railroad.

Cairo & St. Louis,

The road is completed to Red Bud, Ill., 15 miles beyond Waterloo, and seven miles beyond the last point noted. An accommodation train is to be put on at once to run from East St. Louis to Red Bud, 38 miles.

Lafayette, La Salle & Clinton.

The organization of this company, which purposes building a railroad from Lafayette, Ind., to Clinton, Ia., was perfected at La Salle, Ill., February 21. Milo Smith, of Iowa, was elected President; W. S. Lingle, of Lafayette, Ind., Vice-President; Daniel Evans, of La Salle, Ill., Secretary, and T. D. Brewster, of Peru, Ill., Treasurer. The names of the directors are Milo Smith and Edward H. Thayer, of Clinton, Iowa; George Clark, of Dover, Ill.; John H. Bryant, of Princeton, Ill.; W. L. Huse, of Peru, Ill.; Alexander Campbell, of La Salle, Ill., Elmer Baldwin, of Farm Ridge, Ill.; Eli Strawn, of Buckley, Ill.; Alexander L. Whitehall, of Watseka, Ill.; Adams Earl and W. S. Lingle, of Lafayette, Ind.; Ralph Plumb, of Streator, Ill., and Lemuel Milk, of Kankakee, Ill. The capital stock of the company is to be $2,000,000, divided into shares of $100.

Cleveland, Mt Vernon & Delaware.

The Cleveland (O.) *Herald* quotes from exchanges a rumor that the Pennsylvania Company will, next season, extend the Massillon Branch of this road from Massillon to Zoar, on the Tuscarawas Branch of the Cleveland & Pittsburgh road, and will extend this latter branch from New Philadelphia to Dennison, thus securing a line from Dennison to Cleveland in competition with the Lake Shore & Tuscarawas Valley.

Penobscot Bay & River.

The Bangor (Me.), *Commercial* says: "New York contractors have proposed to construct the road on these conditions between Rockland and Winterport: They will build the road for $30,000 a mile and receive in payment $300,000 in money and the balance in the bonds of the road at 85 cents on the dollar. If the $300,000 in money can be raised, work upon the road will be commenced immediately. There is every prospect that the sum will be raised forthwith. The Knox & Lincoln road will contribute $100,000." The distance from Rockland to Winterport is about 45 miles.

Maine Central.

This Company has refused to take the cars of the Boston & Maine Company over its road, on account of a special contract with the Eastern Company. The case will be carried before the courts.

New Orleans, Mobile & Texas.

Work on the bridge over the Atchafalaya, on the Louisiana Division, has been commenced. The whole amount of grading done west of Vermillionville is now 59 miles.

Wilmington, Charlotte & Rutherford.

The first-mortgage bondholders of this road have obtained a decree of foreclosure in the Superior Court of Wilmington, N. C. The bondholders of the road have compromised with a number of creditors of the road who were resisting the foreclosure. C. M. Steadman, E. E. Burrows and J. D. Taylor are appointed Commissioners to sell the road after giving forty days' notice. The bondholders assert that they will complete the road to Charlotte by January 1, 1874.

Texas Railroad Projects.

The Colorado, Austin & Lampasas Company intends to build a railroad from Austin northwest to Lampasas, 70 miles.

The Dallas, Palestine & Southeastern Company intends to construct a railroad from Dallas southeast to Palestine, 100 miles, and to extend the road from Palestine southeast to a connection with the New Orleans, Mobile & Texas.

Both companies are now asking the Legislature for charters.

Erie.

The Port Jervis (N.Y.) *Gazette* says: "The locomotive repair shop at Port Jervis, heretofore under the jurisdiction of the Jersey City shop, will, from the 1st of March, be an independent shop. Mr. J. Van Vechten has been appointed Master Mechanic of Port Jervis shop, appointment to take effect March 1."

These shops have been much enlarged since the burning of the Jersey City shop last summer and now employ about 450 men, of whom 260 are in the locomotive shop, and 190 in the car repair shop.

Lake Shore & Tuscarawas Valley.

A special meeting of the stockholders of this company is to be held at Cleveland, O., March 10, to vote upon the question of extending the road beyond the present terminus at Uhrichsville, O., and also to authorize the issuing of bonds by the company, and the execution of a second mortgage upon its railroad and property, to secure the payment thereof.

Texas & Pacific.

The surveying party from Colorado River eastward has connected with the line surveyed from the east near the Pimas Villages.

Chesapeake & Ohio Canal.

At a meeting of the stockholders of this company at Annapolis, Md., February 18, the report of the Committee on Revision of Tolls was presented, and it was resolved to increase the tolls on coal five cents per ton, making the tolls for the coming season 51 cents per ton.

Tyler Tap.

A company has been organized under this name to build a branch railroad, about 18 miles long, from Tyler, Tex., southeast to Troupe, on the Red River Division of the International & Great Northern Railroad.

Auburn & Springport.

A railroad is proposed, to extend from Auburn, N. Y., southwest to Union Springs, on the Cayuga Lake Railroad, a distance of 12 miles.

Schenectady & Susquehanna.

Of this road, which extends from Schenectady, N. Y., to Quaker Street, on the Albany & Susquehanna, 15 miles, the Utica (N. Y.) *Herald* says: It will require $150,000 to complete the Duanesburg Railroad, and as there are no funds, the property will probably be sold under the mortgages."

Long Island.

The company is making surveys for an extension of the Port Jefferson Branch to Riverhead.

Crawfordsville, La Salle & Northwestern.

Articles of association of this company were filed with the Secretary of State of Indiana, February 28. The route described is from Crawfordsville, Ind., northwestward through Pleasant Hill, in Montgomery County, and Newton and Attica, in Fountain County, and through a part of Warren County, Ind., to a junction with the Chicago, Danville & Vincennes and Toledo, Wabash & Western railroads at Hoopeston, Ill., a distance of 69 miles. The capital stock is to be $300,000.

Free Railroad Law in Pennsylvania.

A supplement to the General Railroad Law of Pennsylvania, which is now before the Legislature, amends that law by providing that all crossings of public roads and railroads shall be made either above or below grade, provided that connection may be made with the railroad of another company, but only by its consent and for the interchange of traffic. The supplement also provides that no bridge shall be built across any river or stream without obtaining the express consent of the Legislature, plans having been first submitted by the company and reported on by a competent engineer to be appointed by the Governor. This supplement, if passed, would practically do away with the free railroad law. It will be noticed that the provisions are exactly the same as those of the law now before the New Jersey Legislature—which is a singular coincidence, to say the least.

General Railroad Law in New Jersey.

A law now before the New Jersey Legislature provides that any number of persons not less than 15 may organize a company and make articles of association which shall specify the route of the road, capital stock (which must be at least $20,000 per mile), names of officers, etc. These articles shall be filed with the Secretary of State, but shall not be recorded by him until affidavit is made that at least $10,000 in cash has been paid in for every mile of road. When all the stock has been subscribed and 50 per cent. paid in, the company shall have all the powers of any railroad corporation created by special act. The usual powers as to condemnation of land, etc., are given. The building of the road must be commenced within six months and the road completed within two years, if less than 50 miles long; if over 50 miles an additional six months' time is allowed for every 20 miles. A majority of the directors must be residents of New Jersey. The capital stock may be increased to $70,000 per mile, and bonds may be issued to an amount equal

to the capital stock subscribed. The toll to be charged on such roads shall not exceed 2½ cents per mile for passengers; 3 cents per ton per mile for first-class freight and 2 cents for all others—this to apply only to freight carried a greater distance than 20 miles. All highways, streets and railroads must be crossed either above or below grade, a provision which it would seem very difficult to carry out. Finally, the bill provides that companies formed under this act may bridge any river or stream only by consent of the Legislature, to whom shall be submitted the location and plan of such bridges. This last provision would do away with all the advantages supposed to arise from a free railroad law, as it would certainly be impossible to build a railroad of any length without crossing one or more streams, and it would probably be quite as difficult to get a charter from the Legislature for every bridge required as to get a charter for the construction of the whole road at once. The real meaning of this last clause is, probably, that the bill is intended to prevent rather than provide for the construction of new railroads.

Philadelphia & Reading.

This company has published its spring rates of freight on coal, which are as follows, the rates given being per ton: The rate from Port Carbon to Richmond, Philadelphia, will be $2, with a drawback of 40 cents on *all* anthracite coal shipped from Port Richmond, including city front. Rate to Philadelphia $2.10, with the usual differences from other shipping points. Rates to Philadelphia by canal—tolls $1.10, freight 65 cents, not including unloading as heretofore. Contracts for coal to be shipped from Richmond can be registered until April 1 at the following rates, to be run until December 1, viz.: Lump, steamer, broken, at 14-40ths of the price of the coal on board at Richmond; chestnut at 140-325ths of the price of the coal on board at Richmond; provided the net rate is not less than $1.40 from Port Carbon. Contracts by canal: Lump, steamer, broken and chestnut, from Schuylkill Haven to New York and vicinity, can be registered until April 1, to run until November 1. Freight and tolls to be one-half the price of coal at wharf at destination, with a minimum of $2.70 from Schuylkill Haven.

Kansas City, St. Joseph & Council Bluffs.

This company has executed a mortgage of $8,000,000 on its road to Arthur Hunnewell, John A. Burnham, Jr., and James H. Blake, of Boston, trustees. The proceeds are to be used for the further equipment and improvement of the road, for additional terminal facilities, and to pay off all floating and other debt of the company. The road and branches are about 260 miles long, making this mortgage at the rate of about $30,800 per mile.

Atlantic, Mississippi & Ohio.

Great complaint is made by the people of Southwestern Virginia of the failure of this company to commence work on the extension to Cumberland Gap, the construction of which the company promised to undertake at the time the consolidated company was formed. Many meetings have been held, and legal proceedings against the company have been threatened.

St. Louis, Hannibal & Keokuk.

The Hannibal (Mo.) *Courier* reports that this company has succeeded in placing a large amount of its bonds, and has purchased iron enough to lay the track from West Quincy, Mo., to St. Charles.

McGregor Southwestern.

This company has been re-organized and Judge Williams, of the Iowa Eastern Company, elected President. A strong effort is to be made to secure the speedy construction of the road.

St. Louis & St. Joseph.

In the suit against the town of Lathrop, Mo., to compel the payment of interest on bonds issued to this company, the Supreme Court has decided that the recital on the face of the bonds did not estop the corporation from inquiring whether the law had been complied with in the issuance of the bonds, and that no election having been held to authorize the issuance of the bonds, they are not valid.

Atchison (Kansas) Bridge.

The St. Louis (Mo.) *Journal*, of Feb. 27, says:

"The King Iron Bridge Company, of Topeka, Kan., has taken the contract for building the bridge over the Missouri, at Atchison, Kan. The price to be paid is $815,700, and the work is to be completed in two years."

Missisquoi & Clyde Rivers.

This newly completed road is leased under a perpetual lease by the Southeastern Counties Junction Railway Company of Canada, and will be operated by the latter company.

Milwaukee & Northern.

The Appleton (Wis.) *Post* reports that arrangements are being made for the extension of the Menasha Branch northwest through New London to Wausau, a distance of 80 miles.

St. Joseph, Kansas & Texas.

A company by this name has been organized to build a railroad from St. Joseph, Mo., southward through Kansas to a connection with the Missouri, Kansas & Texas road.

Muscatine Western.

The contract for the grading of a further section of 21 miles, west of the Iowa River, has been let.

ANNUAL REPORTS.

Maine Central.

At the annual meeting of this company recently, the report of the board of directors was read. The receipts for the past year were as follows:

From passengers	$877,408 72
From freight	947,805 17
From other sources	111,265 38
Gross earnings	$1,936,479 29
Operating expenses	1,329,641 39
Net earnings	$606,837 90

The gross earnings show an increase over 1871 of $370,209.04, or 23¾ per cent., and the net earnings an increase of $135,266.62, or 28¾ per cent. The expenses were 68¾ per cent. of the gross earnings, and the gross earnings were at the rate of $5,470 per mile.

The mileage of passenger trains during the year was 532,807; of freight trains, 397,940; of miscellaneous trains, 258,136; total mileage, 1,187,883. The average cost per train mile was $1.12. The number of passengers carried was 672,215, equivalent to 24,930,491 carried one mile. The increase in passengers carried one mile was 3,937,892, or 19¼ per cent. The trains transported 359,286 tons of freight, equivalent to 21,034,916 tons carried one mile, an increase in tons carried one mile of 221,186, or 1¼ per cent. The average distance traveled by each passenger was 37 miles.

The lines operated by the company are the Portland & Kennebec Division, from Portland to Augusta, 63 miles; the Bath Branch, nine miles: the Somerset & Kennebec road, from Augusta to Skowhegan, 37 miles; the Maine Central Division, from Cumberland to Bangor, 129 miles; the Androscoggin Division, from Brunswick to Farmington, 63 miles, with a branch from Crowley's to Lewiston, 5 miles; the Belfast & Moosehead Lake road, from Belfast to Burnham, 34 miles; and the Dexter Division from Newport to Dexter, 14 miles, a total of 354 miles of road.

Opinion of the Illinois Supreme Court in Declaring Unconstitutional the Existing Law against Discrimination in Freight Rates.

The Chicago & Alton Railroad Company vs. The People, ex rel. Gustavus Koerner, Richard P. Morgan, Jr., and David S. Hammond, Railroad and Warehouse Commissioners. Appeal from McLean.

Opinion of the Court by Mr. Chief Justice Lawrence:

This record brings before us the proceedings upon an information in the nature of a *quo warranto* filed by the Railroad Commissioners of the State against the Chicago & Alton Railroad Company, under the act which went into operation July 1, 1871, entitled "An act to prevent unjust discriminations and extortions in the rates to be charged by the different railroads in this State for the transportation of freight on said roads." The information set forth that the company, in violation of this act, had repeatedly charged and received for transporting lumber from Chicago to Lexington, a distance of 110 miles, the sum of $5.65 per 1,000 feet, while, at the same time, it had only charged for transportation of like lumber from Chicago to Bloomington, a distance of 126 miles, the sum of $5 per 1,000 feet. The company, by way of defense, pleaded its charter, and alleged that the rates of toll from Chicago to Lexington were in fact reasonable, while the rates from Chicago to Bloomington were unreasonably low, and were established because of the competition at the latter point, with the Illinois Central Railroad Company. To this plea the relators demurred. The demurrer was sustained, a judgment of ouster was pronounced against the company, and its franchise was declared forfeited. From this judgment the company has prosecuted an appeal to this Court.

The question involved in this record is the constitutionality of the act of the Legislature under which the information was filed. The object of the General Assembly in passing the law is indicated by its title, which we have already given. The substance of the first section of the act is, that no railroad company in this State shall charge a larger compensation for the transportation of freight over any distance than it is charging at the same time, for freight of the same class, over a less distance, nor shall it charge the same amount that it charges over a less distance. Another clause of the same section provides, that no railroad in this State shall charge a larger compensation for freight over any portion of its road than is charged for freight of the same class over any other portion of equal length. The second section of the act merely defines what is meant by the phrase "railroad corporations."

The third section makes the rate of the year 1870 the standard for freight charges. This section is not brought before us by this record. The fourth section provides for the recovery of a penalty of $1,000, in an action of debt, together with a reasonable attorney's fee, by any person aggrieved by the violation of this act. The fifth and last section provides that any willful violation of this act, by any railroad corporation, "shall be deemed and taken as a forfeiture of its franchises," and authorizes a proceeding to that end, such as is before us in the present record.

Very elaborate arguments have been filed by counsel, but they are chiefly devoted to a discussion of the power of the Legislature to control the rate of railway charges, or to fix their maximum limit. It is urged by counsel for the company that its charter is a contract with the State, by which the latter has irrevocably granted to the corporation the right to establish its rates of toll, subject only to an implied condition, which is admitted by counsel, that they shall not be unreasonable or excessive. It is further urged that this charter with all the privileges it granted, is protected under that clause of the Constitution of the United States which prohibits the States from enacting any law impairing the obligation of contracts. On the other hand, it is contended by counsel for the relators that railroad corporations which obtain their right of way through the exercise of the right of eminent domain—a right belonging only to the sovereign power of the State, and to be delegated by that power only for public purposes—must be regarded as quasi public corporations, and therefore subject to legislative control, so far as may be necessary for the public welfare, of which the Legislature must necessarily be the judge. It is further contended that the right to control and regulate their tolls is a species of public power, which the Legislature can not alienate from the State, even if it should so desire, because essential to the proper sovereignty of the State.

These propositions of counsel invite us to a wide field of discussion, upon which we do not, at present, propose to enter. We have stated them for the purpose of saying, in terms, that we express no opinion in regard to them, and do not propose to do so until a case shall come before us demanding their discussion. There are laws upon the statute book involving their consideration, but the act before us does not necessarily do so in its application to the present case, and the expression of an opinion in regard to legislation not involved in this record would be obviously improper. Conceding, for the purposes of this appeal, all that is claimed by counsel for the appellant in regard to the inviolability of railroad charters, regarded in the light of contracts, we are still of opinion that the Legislature has the clearest right to pass an act for the purpose of preventing an unjust discrimination in railway freights, whether as between individuals or communities, and to enforce its observance by appropriate penalties. The grounds of this opinion may be briefly stated, and they are as follows:

A railroad company is chartered, and is chartered solely, for the purpose of exercising the functions and performing the duties of a common carrier. The duties and liabilities of common carriers are clearly defined by the common law, and have been so defined for centuries. In all commercial countries the law upon this subject is one of the most important branches of legal science, and its leading principles were established by the courts of England at an early day. One of these principles is that nothing excuses the carrier for the non-delivery of the goods received by him for carriage, except the act of God or the public enemy. We do not find it written in the charters of railroad corporations in this State that they shall exercise their franchises subject to this stringent liability, yet, nevertheless, this Court has firmly held them to it, not permitting them to evade it, even by a notice, or by any means short of a special contract with the shipper, to which his free assent must be shown to have been given. Another perfectly well-settled rule of the common law, in regard to common carriers, is that they shall not exercise any unjust and injurious discrimination between individuals in their rates of toll. In the language of Chief-Justice Holt, when delivering the opinion of the Court of King's Bench, in the celebrated case of Coggs v. Bunard, 2 Ld. Raymond, decided in 1703, the common carrier "exercises a public employment," and it necessarily follows that he must deal with the public fairly and without unjust discrimination. This common law duty of common carriers is not prescribed in the charters of railroad corporations, but, like the other duty of delivering goods in safety, unless prevented by the act of God or the public enemy, it attaches to them, by virtue of their function of common carriers, the moment they commence the transportation of freight. In accepting their charters, which gave them an artificial existence as common carriers, they necessarily accepted them with all the duties and liabilities attached, by the existing law, to the function of a common carrier. The proposition seems to our minds so plain as hardly to admit of more argument than an axiom in mathematics. While the law now imposes, and always has imposed, upon individuals exercising the vocation of a common carrier the obligation of rendering service to all persons, without injustice to any, how utterly unreasonable it is to claim that a corporation is to be permitted to discriminate in its tolls at its discretion, and without regard to justice, merely because the Legislature, in the charter that created it for the purpose of exercising a like vocation, has authorized it to establish rates of toll, without in terms providing that they shall be free from unjust discrimination. What was the import of that grant, made as it was in broad and general terms? Clearly nothing more than that the corporation should have the same right of establishing tolls that a natural person has when acting as a common carrier—a right to be exercised within the same limitations that the common law, in behalf of justice and public policy, imposes upon the natural man.

This case has been argued on both sides with commendable ability and candor, and we avail ourselves of an admission made by counsel for the company, to illustrate the position we are enforcing. It is conceded by counsel in express terms that "a natural person is not allowed to make unreasonable and excessive charges as a common carrier, and an artificial person is subject to the same restrictions." It is, of course, contended by counsel that the Legislature has no power to determine what charges are reasonable or unreasonable, but with that branch of the question we have, in this case, no concern. It is undoubtedly true, as conceded by counsel, that the artificial person has no more right than the natural person to make unreasonable and excessive charges as a common carrier. And why? This restriction is not found in railway charters as generally framed, and certain not in the charter presented by this record, in regard to which counsel are speaking. The obvious reason is, the principle we have already stated. The rule forbidding unreasonable charges was a common-law rule when these charters were granted, and the companies accepted their charters with this implied limitation upon the power granted, in general terms, to establish their rates of freight. If this implied condition against unreasonable rates of freight attached by the existing law to their charters at the date of their acceptance, on what ground can it be held that the corresponding condition against unjust discrimination did not equally attach? There is no ground for the distinction. The charters were granted for the purpose of furnishing improved means of transportation and travel to all persons alike, without unjust discrimination between individuals or communities, and they were accepted with the knowledge that the nature of the grant imposed that obligation. This question of unjust discrimination is not before this court for the first time. In the case of Vincent against this same company, 49 Illinois, 33, we held that railway companies can make no injurious discrimination between individuals, and therefore could not charge one rate for delivering grain at a certain elevator in Chicago, and a higher rate for delivery at another elevator in the same city, and equally accessible upon its line. The same rule was recognized in The People vs. C. & H. R. R. Co., 55 Illinois, 111, though the facts of that case were found not to require its application. The rule was again declared in C. & N. W. R. R. Co. vs. The People, not yet reported, but to appear in 56 Illinois. The opinion in that case cites several English and American cases in which it was held that railway companies could not be permitted to practice an injurious and arbitrary discrimination between different persons, and we now refer to them without further citation.

If, then, an unjust discrimination is not to be permitted, as between individuals, in regard to freights, is it any more permissible as between different communities or localities? We are wholly at a loss to discover the slightest difference in reason or principle. If a farmer, living three miles from the Springfield station, upon this company's road, is charged 15 cents per bushel for shipping his corn to Chicago, is it just that the farmer living twenty miles nearer Chicago should be charged a higher sum? Certainly not, unless the railroad company can show a peculiar state of affairs to justify the discrimination, and this must be something more than the mere fact that there are competing lines at one point and not at the other. The discrimination, in such a case, is as much a discrimination between individuals as it would be in reference to two persons living in the same locality, and shipping at the same station, unless, as before stated, a satisfactory reason can be given for discrimination between the points of shipment; and such a reason, in the case supposed, it is not very easy to conceive.

So, too, in the case before us. The resident of Bloomington who sends to Chicago for a car of lumber, is charged by the company at the rate of $5 per 1,000 feet for transportation. The resident of Lexington, who orders the same lumber at the same time, is charged $5.65 per 1,000 feet for a transportation 16 miles less in distance. Is there not here, unless an explanation can be furnished by the company, an unjust discrimination between individuals quite as much within the prohibition of the principles of the common law, as would be an unjust discrimination between individuals of the same town?

We have endeavored to show on what a firm foundation rests the constitutional power of the Legislature to prohibit unjust discriminations in railway freights, even conceding what is claimed for their charters as contracts.

We should, however, be doing the counsel for appellant an injustice if it were to be inferred, from what we have said, that they distinctly assert a right, on the part of the company, to make unjust discriminations.

We understand them to concede, in the conclusion of their argument, the power of the Legislature to prohibit such discrimination, but they insist that no discrimination is unjust, if the person against whom it is made is not himself charged an unreasonable rate. They therefore averred, in their plea to the information, that the charges for freight to Lexington, were, in fact, reasonable, and those to Bloomington were unreasonably low. But in our opinion, if the act of the Legislature had directed its penalties, as it should have done, not against all discriminations, but only against unjust discriminations, and had made *that* the issue to be tried, it would have been no answer to aver, in the plea, that the larger rates for the less distance were reasonable rates. That would have had only an argumentative bearing upon the issue to be tried, to wit: the existence of an unjust discrimination between neighboring towns. What is a reasonable rate of freight over a railroad is, at best, a mere matter of opinion, depending on a great variety of complicated facts, which but few persons could intelligently investigate, and which it would be wholly in the power of the company to furnish or withhold. Railroad experts might be produced who would testify that, in their opinion, the rate to Lexington, in the present case, was a reasonable rate, but the fact that a less rate was charged for the greater distance, to Bloomington, if the difference was a permanently established and not a casual difference, and if it could be explained only by the fact that there was a competing line at one place and not at the other, might be well accepted as conclusive proof that the rate to Lexington was not a reasonable rate. The only issue to be made, under a law properly framed, would be whether there was an unjust discrimination or not. If, on the trial of such an issue, the prosecutor proves a permanently established discrimination, like that disclosed by the present record, and the company can show no other reason for it than the existence of a competing line at the favored point, the defense must be held unsatisfactory, notwithstanding witnesses may testify that they believe, as a matter of theoretic opinion, that the rates to Lexington are reasonable. They cannot be reasonable, and the discrimination must be unjust if the lesser rate for the greater distance have been established merely because the company has ceased to exercise at that point a practical monopoly. It cannot be supposed that either of the competing lines would establish a permanent rate of charges upon a scale that would not furnish a remunerative profit. The rates to Bloomington

would be established under the influence of a fair competition, which, by the ordinary laws that govern commerce, might be relied upon as establishing a rate unreasonably low. At Lexington the rates would be established by the uncontrolled discretion of the company, and it should not cause surprise if they were fixed unreasonably high. If the rates are not unreasonably low at Bloomington, they are unreasonably high at Lexington. If they are unreasonably low at Bloomington, and at all other points touched by competing lines, is it not certain that the company will indemnify itself by charging, at the station where there is no competition, a rate unreasonably high? And will not a discrimination, arising solely from such a cause, be necessarily an unjust and injurious discrimination to all persons shipping or receiving freights at the non-competing stations?

If Lexington is a town where considerable business is done, it is evident that the discrimination of rates, if permanently established, will diminish its business and check its growth. It was never intended or expected that these corporations should use their power to benefit particular individuals or build up particular localities by arbitrary discrimination in their favor that must cause injury to other persons or places engaged in rival pursuits or occupying rival positions. It is in vain to say in defense of such discriminations, made without just cause, that the rate of charges against the injured person or locality is a reasonable rate, and therefore no injury is done. An injury, as a matter of fact is committed, in the manner just suggested, and the Legislature has the right to require the corporation to show a sufficient cause for the discrimination which produces the injury, and it cannot be permitted to evade the issue by raising the speculative inquiry as to whether the rates charged against the injured parties or localities are not, after all, reasonable rates. Even if reasonable, when regarded in reference to the profit upon the capital invested in the road, they are not reasonable in the true sense of the term, if no satisfactory reason can be given for charging less rates for the same or for greater services rendered to persons doing business with the company at neighboring stations.

From what we have said, it will be seen that the object of the law under which these proceedings were instituted was, in my opinion, clearly within the power of the Legislature. The law was intended to prescribe the methods by which to enforce a common law duty that the railways of the State voluntarily assume whenever they exercise the functions of a common carrier, and it is, in one respect, a violation of their charters. It remains to be considered whether there are defects in the details of the law which need to be amended before it can be executed. We are of opinion that there are such defects, but they are susceptible of easy amendment.

The discrimination forbidden by the common law to common carriers is an unjust or unreasonable discrimination. The provision in our new Constitution is also against unjust discrimination. It is in the following words: "The General Assembly shall pass laws to correct abuses and prevent unjust discrimination and extortion in the rate of freight and passenger tariffs on the different roads in this State, and enforce such laws by adequate penalties, to the extent, if necessary for that purpose, of forfeiture of their property and franchises." Art. XI., Sec. 15.

This provision, expresly directing the Legislature to pass laws to prevent *unjust* discrimination, is a recognition of the palpable fact that there may be discriminations which are not unjust, and by implication it restrains the power of the Legislature to a prohibition of those which are unjust. That was undoubtedly the object of the Legislature in passing the existing law. This is clearly shown by its title. But the act itself goes further. It forbids any discrimination whatever, under any circumstances whatever, and whether just or unjust, in the charges for transporting the same classes of freight over equal distances, even though moving in opposite directions, and does not permit the companies to show that the discrimination is not unjust. The mere proof of the discrimination makes out a case against the railway companies, which they are not allowed to meet by evidence showing the reason or propriety of the discrimination, and then upon this sort of *ex-parte* trial imposes as a penalty for the offense a forfeiture of the franchise, which would often be equivalent to a fine of millions of dollars. The object of the law is commendable, but such a proceeding, to be followed by such a penalty for the first offence, cannot be sustained. It could only have been authorized through the inadvertence of the Legislature. The law as it now stands makes an offense out of an act which might be shown not to be an offense, but an exercise of a wise discretion really beneficial to the people of the State; and, while debarring the companies from all right of explanation, confiscates their franchises upon the first conviction. The Legislature cannot raise a conclusive presumption of guilt against a natural person from an act that may be innocent in itself, taking from him the privilege of showing the actual innocence or propriety of the act, and confiscating his property as a penalty for the supposed offense. Those provisions of our Constitution which forbid the deprivation of life, liberty or property, except by due process of law, and which guarantee the right of trial by jury "as heretofore enjoyed," and the right in all criminal prosecutions to appear and defend in person and by counsel, would all be violated by such a law. These provisions, it is true, are designed to apply only to natural persons, but artificial persons must be permitted to invoke the spirit of justice which prompted them, so far as may be necessary, to protect their property and franchises against the operation of a law that substantially condemns without a trial.

That the naked fact that a railway company charges a larger sum for transporting freight of the same class over a given distance than it is charging for the same distance over another part of its road, or in the opposite direction, is not of itself conclusive evidence of an unjust discrimination, will be manifest on a moment's consideration. Take, for instance, the road of the appellant, with one terminus at Chicago and the other at East St. Louis. At one season of the year more freights are moving from Chicago toward East St. Louis than in the opposite direction. The consequence, of course, is that the supply of empty cars at the latter point will be in excess of the demand. There is a water route between these points, which also touches several intermediate stations upon the road. Now, unless the railway company is permitted, under such circumstances, to induce shipments over its lines by lowering its freights, it is evident that a portion of its cars will return empty. This would, of course, necessitate a higher charge for freight moving toward St. Louis than it would be necessary to impose if return freights could be secured by lowering the rates on the return trip. To forbid the company to lower the rates of return freights would thus benefit no one, and would work an injury both to the company and to the people along the line. At other seasons of the year the larger amount of freight is moving in the opposite direction, and the operation must be reversed.

We give this illustration for the purpose of showing that a difference of price, for the same distance of transportation, is not necessarily an unjust discrimination, and that any law must be fatally defective which infers guilt as conclusive presumption from the mere fact of difference of rates, without permitting the companies to show why the different rates were adopted.

We may so far take judicial notice of the course of public affairs in this State as to say that the real abuse which the Legislature was endeavoring by this act to prevent, was not such proper discriminations as those we have just been supposing, but the practice which had become general among the railways of charging a higher compensation for carrying the agricultural products of the State to market, when shipped at a station where there was no competing line, than when shipped where there was such competition, although the distance over which the freight was carried in the latter case might greatly exceed the distance in the former. The same system also prevailed in regard to freight from Chicago to points in the interior, although probably not felt to be so great an evil. For discrimination of this character, when adopted as a system, we can certainly perceive neither justification nor excuse, but nevertheless it is the right of a company, when prosecuted on the ground of unjust discrimination, to offer what evidence it can by way of explanation. It might, for example, show in the present case that the lumber shipped to Lexington had caused a greater expense in loading or unloading than that shipped to Bloomington. This may not be a probable defense, but defenses may nevertheless exist, and, if they do, the companies should not be deprived of the right to make them.

Before this act can be enforced, it should be so amended as to correspond with the requirements of the Constitution, by directing its prohibition against unjust discriminations. It should make the charging of a greater compensation for a less distance merely *prima facie* evidence of unjust discrimination, instead of conclusive evidence, as it now is; and it should give to the railway companies the right of trial by jury, not only on the fact of discrimination, but upon the issue whether such discrimination is just or not.

There is another feature in this law to which we deem it our duty to advert. As the act now stands, a forfeiture of all franchises is the only penalty that can be imposed upon a company in a prosecution instituted on behalf of the people, and it is imposed for the first offense. This, as already remarked, in some cases would amount to a fine of millions of dollars. Is not this a violation of the spirit of that constitutional provision which says, in terms, that "all penalties shall be proportioned to the nature of the offense?" Is it not also a violation of the spirit of the very clause of the constitution under which this act was framed, and which requires the Legislature to pass laws to prevent unjust discrimination and extortion by railroad corporations "and enforce such laws by adequate penalties, to the extent, *if necessary for that purpose*, of forfeiture of their property and franchises?" Would it not be better to enforce the law by a series of considerable and increasing fines, before imposing the final penalty of forfeiture? A law admitting of but one penalty, and that of the harshest possible character, will, necessarily, be subjected by the Courts to close criticism and a strict construction.

The English Parliament passed a law in 1854 prohibiting the giving of undue or unreasonable preferences or advantages by railway companies. Under this act various cases have arisen in the English courts, which have been cited by counsel. It is unnecessary to comment upon them. They hold, as we do, that a discrimination is not necessarily an unjust discrimination. That is to be determined upon the evidence.

The opinion of the Court is that, while the Legislature has an unquestionable power to prohibit unjust discrimination in railway freights, no prosecution can be maintained under the existing act until amended, because it does not prohibit unjust discrimination merely, but discriminations of any character, and because it does not allow the companies to explain the reason of the discrimination, but forfeits their franchise upon an arbitrary and conclusive presumption of guilt, to be drawn from the proof of an act that might be shown to be perfectly innocent. In these particulars the existing act violates the spirit of the Constitution. The judgment of the Circuit Court ousting the appellant of its franchises, must therefore be reversed.

Judgment reversed.

The Regulation of all Railroads through the State Ownership of One.

BY CHARLES FRANCIS ADAMS, JR.

[A speech on behalf of the Massachusetts Board of Railroad Commissioners, made before the Joint Standing Legislative Committee on Railways, February 14, 1873.]

MR. CHAIRMAN AND GENTLEMEN OF THE COMMITTEE:

In compliance with your request, as expressed in a formal vote communicated to us, I am instructed by the Board of Railroad Commissioners to appear before you and publicly submit for your consideration certain views in relation to the subject of State railroad ownership as bearing upon the matter now before you; which views that board has arrived at after long and anxious deliberation.

And in the first place I desire to lay before you the following draft of a resolve, as a practical question for immediate consideration:

Resolved, That the governor and council be requested to ascertain and inform the Legislature, as soon as may be practicable, upon what terms, if any, the Commonwealth can purchase the rights, titles, property and franchises of the Fitchburg, the Vermont & Massachusetts and the Massachusetts Central Railroad corporations; and further, to ascertain and report what legal measures it would be necessary or advisable to take, to enable the Commonwealth to assume possession, under any powers reserved to it by law or under the right of eminent domain, of the roads properties and franchises aforesaid, with estimates as to what would be the probable cost to the Commonwealth of so doing.

Now, gentlemen, in presenting to you what I have to say, I shall try to confine myself very strictly to the matter in hand. I shall neither ask you to go back with me into the early history of American civilization, nor into any other branch of pre-historic inquiry. Neither shall I seek to transfer you across either ocean to consider the probable effect of any decision at which you may arrive upon the future destinies either of China or of Russia. And, in case I should wander away into these fields of rhetoric and of imagination, I sincerely hope that you will recall me to realities, and will not hesitate to direct my attention more particularly to the very important questions under immediate consideration.

THREE THINGS ASSUMED.

In order to sweep away much of the unnecessary preliminary matter which has accumulated, as it seems to me, in the course of these hearings, I shall take three things for granted.

I shall, in the first place, assume that a large and remunerative business awaits the completion of the tunnel route. That should be inferred from the notorious fact, that, after mature discussion in years gone by, the Legislature authorized the construction of the tunnel at a cost of some twelve or fourteen millions of dollars. It must be presumed that your predecessors were men of reasonable discretion, and that, before embarking in this costly enterprise, they fully satisfied themselves as to its expediency. Even if they failed to do so, it is now too late to repair their negligence. The tunnel approaches completion; it remains for us only to develop its utility to the utmost.

I shall then further assume that, in order to accommodate this expected traffic, a united corporation is necessary. This, I fancy, no one will deny who has any familiarity with railroad economy. The day for disunited, squabbling, connecting lines is long past. They can neither fulfill the reasonable demands of modern business development, nor, in competition, can they hope to hold their own against united corporations. This fact is so well settled that it seems a mere waste of time to prolong its discussion.

Finally, I shall ask you to consider all discussion of details as premature at this stage of our investigations. We have as yet neither reliable statistics nor legal advice; nor can I pretend myself to have bestowed that careful consideration upon the subject in all its bearings which would alone entitle any opinion I might advance to a moment's consideration. Hereafter, when you shall have upon your table the information called for in the resolve I have read, we may more properly enter upon minutiæ. To-day I propose to confine myself to general principles. We are now to consider a policy; its detailed development will follow at another time.

THE BURDEN OF PROOF.

Now, gentlemen, in appearing here to urge upon you the taking of the preliminary steps which are to result in the Commonwealth of Massachusetts "going" (as it is commonly expressed) "into the railroad business," I am fully sensible, the Board of Railroad Commissioners is fully sensible, that a heavy burden of proof rests upon us. We do not in any respect desire to shirk or to reduce it. We propose an innovation—an innovation upon a long established and, it was supposed, firmly settled principle, which lies at the foundation of our industrial and political systems. Could I state the case in broader language, I would do so, to make clearer yet our deep sense of the responsibility under which we act. In proposing this innovation, therefore, we are bound to show, not only that a change of policy might be beneficial, but that it is necessary; not only that what we suggest promises good results, but that what exists is producing bad results; not only that there is a balance of probabilities on the side of the innovation we recommend, but that it could hardly result in a worse condition of affairs than now is or is obviously impending.

NO INDUSTRIAL INTERFERENCE A FUNDAMENTAL PRINCIPLE.

No principle is or should be more firmly established at the base of our American polity than that our governments should have the least possible connection with industrial enterprises. This great principle, pardon me for adding, has few more ardent or earnest advocates than myself. In my own place I look upon every breach of it with profound regret. I respect every man who maintains it, even after reason has got the better of my own strong prejudice in its favor. Yet there are occasions, as I think I shall demonstrate to you, when an innovation upon this great principle is necessary, and when, to save it, its wiser friends concede an exception to it. When that occasion arises the innovation cannot be too speedily made, if we would save the principle from the great popular discredit which follows its apparent failure.

EXCEPTION TO THE RULE.

The class of occasions in which this innovation is necessary is well and clearly defined in an article on this paper which I hold in my hand. It is the New York *Nation*, a paper well known for its ability and for its free-trade proclivities—a determined opponent of the whole theory and system of paternal meddling and government interference. The article from which I read is in the issue of 9th February, and, from internal evidence, I have no hesitation in attributing it to the pen of the Hon. David A. Wells. It is on the subject of the postal telegraph, a scheme which meets with no favor in that quarter. Mr. Wells here lays down the principle that the government ought not to interfere with industrial undertakings, and he then proceeds to say:

"There is but one case which warrants such interference, and that is essentially the same for all departments of industry. That case arises for a republican government when any one branch of the business of the community is so monopolized that citizens can no longer share in or control it, and so mismanaged that they can no longer endure it. When that day comes, either in the shoe trade or the coal trade, in the conduct of a Pennsylvania petroleum combination, or of railroads and telegraphs, government is warranted, when all other remedies have failed, in prostrating private enterprises by the crushing hand of power, and supplanting private industry as best it may."

I accept this definition as laying down the principle on which we appear before this committee to-day. Accepting it, I at once take the parallel which is usually advanced in these cases. I have myself seen it advanced within the last week in the columns of the daily press, and I have heard that it has been advanced in the discussions held in the Board of Trade on this very subject. That parallel is usually thus expressed: "The government has no more to do with the railroad business than it has to do with the business of making shoes, or spinning cotton, or baking bread." I accept this parallel, as presented by the opponents of the innovation now proposed, and I proceed to point out where the distinction which has escaped them lies.

COMPETITION AND SUPPLY AND DEMAND.

What is the principle upon which the cotton factory, the shoe factory and the bake house are by common consent exempted from all government interference? It is simply because those conducting business in them are completely subject to the laws of supply and demand and of competition. If these persons were to realize from their business an inordinate profit, other persons, without any intervention of government, would enter into it, and the rate of profit would speedily fall to the average rate of profit in the community. Under these circumstances, the exceptional condition of affairs referred to in the article from which I have quoted cannot arise. Where capital and industry are free to flow no monopoly can exist. Now what is the case as regards railroads? You, gentlemen, perfectly well know that

wherever combination is possible (it is the shrewd aphorism of old George Stephenson) competition is impossible. The only thing which can enable competition to exist is the presence of competing forces too numerous to combine. Look abroad over this country and you will see at a glance what competition amounts to so far as railroads are concerned. Take, I pray you, the case of New York and Chicago, two cities a thousand miles apart, between which railroads have been constructed as fast as private capital could construct them. Every gentleman on this committee knows that not a rate is charged between New York and Chicago that is not established by combination. You know that every time the tariff is to be raised or lowered, the freight agents of the several companies meet in convention, and they decide how much it shall be raised or how much it shall be lowered, and the change agreed upon takes effect upon all the roads on a given day. You know—every man who has looked into this subject knows—that the only competition which exists is between land transportation and water transportation. Where water enters into the struggle, when navigation opens, then the freight agents meet and rates are reduced; when the lakes freeze up, then the freight agents meet again and the rates are raised. Whether reduced or raised, however, the change always is the result of combination.

RAILROAD COMPETITION EXISTS ONLY TO COMPETING POINTS.

Again, let us look at this question from another point of view. The idea of competition certainly implies the existence of several agents. As regards railroads, however, even the *combination* of competitors is limited to a few localities. Except at competing points, points that is upon which railroads converge, transportation by rail is a pure, absolute monopoly, affected only by municipal law and considerations of self-interest, and in no degree subject to the influence either of competition or of supply and demand. Now how large a proportion of all the towns on our railroads are points of railroad convergence? In other words, how many of them can look for even a pretence of protection from monopoly through competition? Take for example the Boston & Albany road. It runs through a densely inhabited region filled with manufacturing cities and towns, it is two hundred miles in length, it has eighty stopping places; but of points of railroad convergence, places at which a possibility of competition exists, it numbers just seven. Take again the Central road of New York; including its Auburn Division it has four hundred and five miles of road, in the very garden and central thoroughfare of the continent; on the whole four hundred miles there exist just nine points of convergence. Six hundred miles of railroad with sixteen competing localities; and those inhabiting all the others may use the Central or the Boston & Albany, as the case may be, or stay at home, just as they prefer. But is it not something of a mockery to refer this system for its regulation to the principles which control the production of boots and cotton cloth?

Nor is the fact that railroad competition is limited to competing points, which necessarily are, and must always remain so small a portion of the whole, a merely theoretical evil. In this State of Massachusetts, since I have been a Commissioner, a railroad superintendent has frankly acknowledged to me that where freight was shipped and paid for to the end of his line, if that freight was switched off at a non-competing point but ten miles from where it came on to his line, and a hundred miles short of its paid destination, he always charged that car $20 extra. Twenty dollars for *not* hauling it a hundred miles! And he justified his extortion. He said that his road must live, and that if he had to haul for cost to competing points, he must get double profits out of points which couldn't compete. In other words, gentlemen—and this fact will bear some degree of reflection—while the result of ordinary competition is to reduce and equalize prices, the result of railroad competition is to produce local inequalities and to arbitrarily raise and depress prices. And yet, the working of this system, this necessary and avowed mixture of pure monopoly with systematic combination, is continually compared by men who profess to think, with a production of boots and cotton cloth!

WHAT ECONOMISTS SAY.

This argument, however, is but the popular one—it is one of those shallow formulas which are continually clattered out through the editorials of the daily press and in the discussions of the market place. No sound thinker that I am aware of has ever lent his authority to this shallow fallacy. Still it has weight among men—and among intelligent men at that, who will repeat and repeat, as though some virtue lay in the very words—"the government has no more to do with the railroad business than it has with the shoe business." Therefore let us turn from argument and see what the authorities say on this subject. Let us go to an opponent of the whole system of government meddling—to an eminent and consistent free-trader—to John Stuart Mill, the greatest of living economists. Upon this subject Mr. Mill says: "There are many cases in which the agency of whatever nature, by which a service is performed, is certain from the nature of the case to be virtually single, in which a practical monopoly, with all the power it confers of taxing the community, cannot be prevented from existing. I have already more than once adverted to the case of the gas and water companies, among which, though perfect freedom is allowed to competition, none really takes place, and practically they are found to be even more irresponsible and unapproachable by individual complaints than the government. * * * In the case of these particular services, the reasons preponderate in favor of their being performed, like the paving and cleaning of the streets, not certainly by the general government of the State, but by the municipal authorities of the town, and the expense defrayed, as even now it in fact is, by a local rate. But in many analagous cases, which it is best to resign to voluntary agency, the community needs some other security for the fit performance of the service than the interest of the managers; and it is the part of government either to subject the business to reasonable conditions for the general advantage, or to retain such power over it that the profits of the monopoly may at least be obtained for the public. This applies to the case of a road, a canal or a railway. These are always in a great degree practical monopolies; and a government which concedes such monopoly unreservedly to a private company does much the same thing as if it allowed an individual or an association to levy any tax they choose, for their own benefit, on all the malt produced in the country, or on all the cotton imported into it."*

THE RAILROAD AND THE MANUFACTURER.

Now, then, by authority as well as reason, I have sought to show you that railroads are not subject to those laws which are safely relied upon to protect the community against the exactions of cotton-spinners and shoemakers. But there is one more point about this. Let us suppose for a moment that we concede the proposition that the government has no right to "go into the railroad business;" but if we concede this, we must concede it in its full length and breadth. Then the government must exercise no supervision whatever over railroads, any more than it exercises it over cotton mills or shoe factories; the railroads must be absolutely free to get all they can in exchange for what it may be their interest to furnish to all who have to deal with them. This, however, I do not understand that the enemies of State ownership at all admit. On the contrary, they strenuously insist that the government should supervise and regulate the railroads, should limit their profits, should fix maxima to their charges; that it should, in a word, confine itself to unlimited meddling, and should never own. Then, after all, railroads do not occupy a position similar to that of cotton mills. What indeed would be the consequence to-day should this Legislature assume toward manufacturers the attitude which it assumes, and which the opponents of State ownership call upon it to assume, toward railroads? Suppose you appointed your Commissioners and obliged your cotton mills to render annual returns of all the details of their business; and then you provided that they should not divide more than so much per cent., or increase or combine their mills, and for a certain class in the community they should manufacture goods at a nominal price, in what would this result? It would indeed bring your cotton mills into the same category as your railroads, but it would reduce your industrial system to a chaos.

THE REAL POLICY OF MEDDLING.

In fact there is a cant about this whole analogy which I wish with all my heart we could get out of the heads of the community. It has got to come out before we can approach at this railroad problem with any hope of a solution of it. It is indeed the opponents of State ownership who are firm, consistent friends of governmental meddling in industrial enterprises. They insist that the Government shall do the work of the railroad managers; and they call it "regulation." They insist that the Government shall reduce meddling to a system; and they call it "supervision." They muddle our railroad legislation into a mass of absurdities; and they call that leaving the railroads alone. We have, I insist, as regards our railroad system been on a wholly wrong track. We have been trying to regulate it, and all the while say we were not regulating it; we have been trying to meddle, and say we were not meddling; we have been trying to manage, and control, and supervise, and all the while we have chattered and canted about competition and the law of supply and demand. It is high time that we began to see things as they are, and to call them by their right names. There is nothing which renders legislation more difficult or more subtly pernicious than this getting hold of a correct principle, and in a dull, monotonous, parrot-like manner making a false application of it; and then dismissing the argument as disposed of. As regards railroads we have done this for forty years.

If, then, the fundamental principle, which forbids the interference of Government with industrial enterprises, must in this case be sacrificed—if a lamentable innovation on it is indeed necessary—how can this be effected with the least degree of public detriment? That some detriment must result, that some public danger must be incurred, we all agree—how can it be reduced to a *minimum?*

MEDDLING BY STATUTE.

The opponents of State railroad management, or ownership in any form, say, "It should be effected as it always has been effected for forty years back, by the passage of statute laws regulating fares, freights, profits, the issue of stock and all things else. This is the least dangerous way." Well, gentlemen, let us see. The passage of a statute law is the natural remedy to which every American has recourse in presence of any matter calling for reform. It is a species of popular, political pill—a panacea, good for all social disorders.

As a general rule the remedy is found to rather aggravate the disorder than to remove its cause; but faith is strong, and the nine failures out of ten trials do not in this case greatly shake it. An act of Legislature is still our sovereign specific. As a means of efficiently regulating railroads and transportation by rail, it has, during the last forty years, been tried very persistently in many countries and in all conceivable forms. So far as my investigations have gone it has uniformly failed. They are still trying it; in this country alone one Congress and some forty State Legislatures turn out more or less statutes every year to the great benefit of the legal profession, but with results small enough as far as the end in view is concerned. But I do not propose to enter further into this branch of the discussion, because, under a resolve of the last Legislature, the Board of Railroad Commissioners was directed to investigate the whole question of the regulation of fares and freights by law. We did so to the best of our ability, and we believe that we have conclusively shown that it is impracticable. At any rate, whether conclusive or not, the results of our examination are now before you in our last annual report, and to further enlarge upon them would be a mere waste of time.

*. "Principles of Political Economy," Book V, chap. xi., § 11.

WHAT IS STATE OWNERSHIP?

But if the regulation of railways, which all agree to be necessary, cannot be accomplished by legislation, how can it be accomplished? How has it been accomplished elsewhere? It has been accomplished by what is known as the State ownership of railways. But what is this State ownership of railways? The general idea, and I think it is the idea which pervades the minds of gentlemen who come up here day after day, is that the government is to own railroads and to run them as it does the postal system; that it is to assume every railroad in the country, large or small; that, in a word, it is to go into the railroad business full tilt. In other words, the subject of State ownership of railroads is not at all understood. People talk very learnedly about it, without any knowledge of it.

So far as I know, no government ever has, and I venture the opinion that no government ever will, own all the railroads subject to its jurisdiction.

In the first place it is impracticable; in the second place it is both unnecessary and inadvisable. Let me refer to the Belgian system, which is the one most commonly discussed. The essence of the Belgian system is found, not in an exclusive State ownership, but in competitions arising from a mixed ownership, part public and part private. The Belgian system, therefore, goes back to first principles; competition plays a more important part in that system than in our own. The State railroads and the private railroads work incessantly side by side. The result is that the one keeps the other pure, and up or down to the mark, just as you choose to put it. They are now discussing in Belgium the expediency of the State assuming all the railroads. I venture the opinion that if this is done, they will find that they have destroyed that to which hitherto they have owed their success. They will have eliminated that element of competition which it should be their great aim jealously to preserve. For the very essence of the system of State management lies, not in the ownership of all the railroads by the government, but in the control and regulation of the whole, through the ownership and management of a part. Upon this fundamental principle I feel that I cannot place too strong an emphasis. In these few words are included the whole theory of State ownership, which I am instructed to urge upon you. And with this statement I come back to my original proposition, and we can now formulate a rule. The admitted general principle is that the government should have no connection with industrial undertakings. If I have established an exception to that rule, as regards some degree of supervision and regulation to be exercised in the case of railroads, then, the exception being conceded, we must also add that in this case the least degree of interference shall be exercised which shall be sufficient to secure the desired result. To this part of the discussion I shall hereafter recur.

THE CRY OF CORRUPTION.

But the moment it is proposed that the Government shall own and operate any part of the railroad system, we are met at the threshold with the cry of corruption. Our opponents exclaim, "See what our Government bureaus are! You will introduce into our politics a larger element of spoils than we even now have. The State Government, instead of owning the railroad, will be but a stepping stone to the possession of the road." I do not wish to depreciate this danger. The "spoils" system as it now exists in our politics is degrading and pernicious enough, and I should be loth to do anything calculated to increase it. But would this measure increase it? Let us see.

THE PRESENT SYSTEM THE MOST CORRUPTING.

I do not hesitate to maintain that of all the devices for introducing corruption into politics and the government which could emanate from the unconscious ingenuity of the most stupid legislator, not one could be found equal to the existing system of railroad supervision and regulation. Upon what does that system depend? It depends upon this, that one man is to regulate and supervise the property of another. Is it consistent with ideas of common sense, is it within the bounds of reason, to suppose that the man who owns will not do his best to control the man who regulates? We know perfectly well how rapidly the movement in this direction is now going on. The sway of the railroad man and the lobbyist is notorious in half the legislatures of the country. And why are they there? They are there because your false system of legislation has effected a separation between the ownership of a thing and its regulation, and he who owns the thing knows he must also own the legislature which regulates the thing. And just so long as you pursue this false system under correct principles—just so long as you deceive yourselves with the idea that you are not meddling all the while that you are doing your best to reduce meddling to a system—just so long as you make one man own a thing and empower another to regulate the value *out* of it—just so long legislative venality and political corruption will increase. And yet the tendency in this direction is no less rapid than it is alarming. All over the country—more elsewhere than in Massachusetts—we see legislatures year by year insensibly, and, as a matter of course, assuming the functions of irresponsible boards of general railroad directors. And by the term irresponsible I mean not amenable to that caution which is inseparable from ownership. In the State of Illinois this position is avowedly assumed. We believe that it must result—that it cannot but result in a conflict of interest, and in grave public and private disaster; that it will result in abuses and scandals and corruptions in comparison with which those which have hitherto startled and shocked us will be but as the dust in the balance.

THE CREDIT MOBILIER EXAMPLE.

But it would be a mere waste of time to cite examples of what I have been asserting from the recent history of State legislation. They are only too notorious—not, perhaps, in Massachusetts, but not far from her borders. Let us go at once to high places—let us glance at that national scandal and disgrace which is now uppermost in all minds. Let us see what the prin-

ciple of supervision and regulation, unaccompanied by ownership, leads to at Washington. Who owns the Pacific Railroad? It was not built by West Point engineers—it was indeed paid for out of the national treasury, but not directly—it is not owned by the United States. No!—if it was, the road would have been built much better and for half its cost. As the country has good cause to know, it was built by an institution known as the Credit Mobilier. The Credit Mobilier owned the property, but Congress reserved a power to supervise and regulate it. What was the result? Bills were introduced into Congress to regulate the rates of transportation over the line, and to these, those who owned it were naturally opposed. What did they do about it? They did not bribe—oh, no!—but they proceeded to "place the stock where it would do most good," for they "wanted more friends in Congress." The record shows whether or no they got them. Those who had proposed to regulate charges over the Pacific road did not prosper thereafter in public life. And all this resulted because the government would not own and would meddle. They would bring two great principles into conflict—the principle of ownership in one man, with the duty of control in another; and as it was in this case, so in the long run will it be in all others, time without end. The man who owns will possess himself of the man who regulates.

THE ANALOGIES.

But let us take a few analogous cases—cases in which the Government owns, and cases in which it supervises. From them let us see where corruption comes in. The subject is rich in analogies; let us take a few of those which most readily suggest themselves. At Washington there is the whole postal system on the one side, and the Union Pacific Railway on the other. I will not waste time by more than suggesting the comparison. The Government owned and managed the one, and did not *own*, but *supervised* the other; which has been the prolific source of corruption? But let us come nearer home. Not a year passes here in Massachutetts that the Legislature does not authorize some city or town to supply itself with water. Why should our municipalities go into the water business any more than into the bread business? Cannot aqueduct companies be organized as readily as gas companies? There is your analogy, now work out the result. Our communities supply themselves with water, private companies supply them with gas The one is owned by the public, the others are supervised by the Legislature. Are your water boards always in the lobby? Are they represented in the halls of legislature? I have never known the time when they were, and I have never known the time when the gas companies were not. Let us take another case. Here is our educational system. Why should the Government enter into the school business? Is it not to many a profession and a source of profit? Why not leave it to competition and the law of supply and demand? Has this violation of our fundamental principle as to governmental interference with business undertakings proved a fruitful source of political corruption? I am not aware that either your committee rooms or the lobby is thronged by your school teachers or their attorneys. Why are they not here? It is simply because you have not sought to divide the ownership of the system from the control of the system.

Suppose you treated your schools as you treat your railroads. Suppose that you went out of the school business yourselves, and proceeded to peddle out charters to others who went into the business to make money. Then suppose you went to work to supervise and to regulate—providing that every one should be educated, and that workingmen's children should be educated at less than cost; that such and such things should be taught, and that so much should be charged for tuition, and so on through all your precedents of railroad legislation. How long would it be before your school teachers would have a lobby up here which would give the Committee on Education as much to do as this committee has now? Fortunately the State has long since entered into certain of the few exceptional lines of business which are practical monopolies, and the harmless, innocent, guileless system of supervision and regulation has been chiefly confined to railroads and gas companies.

WHY THE STATE SHOULD TAKE THE TUNNEL LINE.

And now, gentlemen, if I have succeeded in establishing my several positions as I have advanced, I may as well state a few reasons why it would be eminently expedient from a practical point of view for the Commonwealth at this time to assume the whole of the tunnel line. In the first place, the proper and immediate development of this enterprise will necessitate a heavy expenditure of money. There is no dollar which could be put into that line during the next ten years with any degree of judgment, which will not earn its twelve per cent. per annum. Any amount of bonds of a State road, with the guarantee of the Commonwealth upon them, and bearing an interest of six per cent., could be sold at par. Money could in this way be procured at the lowest rate, and without the intervention of a Credit Mobilier. The indorsement of the Commonwealth is good in money markets where private corporations are unknown. If you wish through the outlay of capital at a low interest to rapidly develop the traffic of this unformed enterprise, in this way you can do it best.

RAILROAD EXPERIMENTS.

But there is another and very important consideration in favor of this step. The Legislature year by year has pending before it or before you (if it has not any this year, it is the first time I have ever known them to be wanting), divers propositions looking to the trial of experiments in transportation. Last year you passed a law compelling the running of cheap early and late trains in and out of Boston; and I well remember that measures were introduced looking to the very cheap transportation of coal. These experiments are always opposed by the railroad corporations, who met them with arguments not easy to disregard. They insist that the Legislature has no right to hazard their property by making them try experiments for the public good, in which they do not believe, but of which they must bear the cost. There is reason in this objection. If you turn your railroads over to private corporations to make money out of them, it seems to me they have a right to say, "We cannot carry goods or persons at a loss, and you have no more right to compel us to do so than you have to compel the cotton factories to turn out certain descriptions of cloth at a fraction of a cent per yard." Yet that is exactly what you did as regards the early and late trains by the law of last winter. You compelled the railroads to transport persons in certain trains at a dead loss Therefore, I say, if the Legislature wishes to pursue these experiments (and there is no man in Massachusetts who wishes to see them pursued more than I do—I have been preaching them for years), they could best and most successfully pursue them at their own cost. If ever the State owns a portion of its railroad lines, then, and not till then, can these most interesting experiments be systematically and fairly tried. You may there test the advantages of cheap passenger trains and of cheap coal trains, and the people will pay the bills. Now the Legislature apportions the benefit to the people, and the bills to the stockholder.

TERMINAL FACILITIES.

But it is said by certain of the many counsel here present, "If you make this consolidation of the Boston & Lowell with the Fitchburg road, what enormous terminal facilities for the new line will be secured in Boston. No such facilities can be secured in any other way. Here they are, ready to your hand—passenger depots, freight depots, elevators, wharves in deep waters—everything indeed that is requisite." I agree, sir, that these facilities are very admirable. At the same time I insist that there is one way of getting even better terminal facilities than these. There is one power which can supply this line with grounds more ample than those of the Fitchburg and the Boston & Lowell corporations combined, and that is the Commonwealth of Massachusetts. Let us see. The State Prison is to be moved away from Charlestown; there then is the State Prison estate. I do not know why that could not be easily and profitably applied to railroad purposes. But the Commonwealth of Massachusetts is no ordinary private corporation. It can even deal with the United States on terms of equality. Why may it not then go to Washington and say to the National Government, "We want the navy yard for our State railroad." Would her Senators and Representatives have great difficulty in securing it? The necessary measure, I fancy, could soon be put upon its passage.

THE CONNECTIONS OF A STATE ROAD.

But it is said that the Commonwealth cannot hold or operate roads beyond the limits of the State; that it is necessary the tunnel line should stretch out to Ontario, to Detroit and to Chicago—yes, to Montana and to Puget Sound! And this can only be done through the agency of private corporations. These visions, gentlemen, partake perhaps a little of the nature of day dreams, but yet, in all sobriety, I would insist that the Commonwealth is in quite as good a position as any private corporation to deal with this class of questions, whenever they shall present themselves. Not that I care to precipitate them to an unadvised solution. After the bitter experience we had two years ago, I would never appear here to forward, by word or deed of mine, the grant of one dollar of the public money to be expended in aid of any private railroad enterprise beyond the limits of the State; and only on the most extreme compulsion would I advocate it within the State. The Hartford & Erie business and the Union Pacific experience, if they proved anything, proved how dangerous and how unadvisable are all these alliances between the State and private companies. It is best—far the best—for the State to hold itself wholly aloof; but if it must intervene it should, we insist, do so as a sovereign and not as a partner; let it take none if it can be avoided, but if it must take any let it take all. But beyond the limits of the State Massachusetts certainly would never plunge into any work of railroad construction which would not return upon its cost its ten per cent. per annum. Private capital is always ready to construct whatever promises a return of ten per cent. But if private capital will build, cannot the State authorize trustees to lease and operate? Why should the State not do for itself in Massachusetts what a private corporation has long done for a railroad company in Pennsylvania? The Pennsylvania Railroad Company does not own or operate a mile of road beyond the limits of the State which chartered it. But there is a wheel within a wheel; there is a "Pennsylvania Company" which leases and holds and operates railroads all over the West in trust for the Pennsylvania Railroad Company. Why should not Massachusetts, if it be found necessary, do that which has elsewhere been found expedient, and empower its board of trustees to lease and operate roads connecting with its State road and to hold them for the use of the people of the Commonwealth?

RUIN TO OTHER ROADS.

But we are met with a new objection to the experiment. After insisting upon it that the State cannot possibly operate a railroad cheaply, or so as to compete with private corporations, our opponents, and with equal earnestness, insist that the cheap transportation which would result from State management would ruin the private corporations. In other words, they argue that the cost of transportation must be kept up that railroads may be remunerative. The argument is slightly suggestive of a confusion of ideas as to whether railroads were made to carry persons and property, or whether persons and property are kept in motion in order to support railroads. It might also be used to recall certain interesting reminiscences of forty years since, when railroads were themselves denounced on account of the injury they involved to such vested interests as turnpikes and stage coaches. Let these pass, however, and meet the argument on its merits. We have authorized private capital to build our railroads in order to make money out of them, and now we propose to compete with them, perhaps to reduce their profits. Yes! We do propose to do just this; we want to stop trying to reduce profits by law and to try henceforth to do it through honest competition. Let us see, in the first place, how what we propose would naturally be expected to operate, and then we will see how it actually has operated elsewhere.

And remember, gentlemen, we propose just so much public ownership as shall enable the State, through the management of a part, to regulate the whole, without recourse to its legislative power; to this extent our experiment goes and no further. But how practically would the management of a part serve to regulate the whole? —for this is purely a practical question. If experience showed that the road owned by the State was operated at a greater expense than private roads, and money was lost on it and taxes incurred through it, is it not natural to suppose that the people of other sections of the State would very decidedly decline to be taxed to make good a loss on a road which did not benefit them? They would say, "Private roads pay, and the public road ought to pay. If it can't be made to pay, then we are not going to be taxed to support it as well as the private roads; it has got to be sold." The railroad corporations are, as every one knows, poor, weak, powerless organizations, yet, with all their weakness and all their impotence, I should not fear to expose them to such a competition as this; they would, I fancy, make very short work of it. On the other hand, if the State railroad should pay, the people of other sections would be apt to ask, "Why should not private roads pay when operated on similar principles?" If, then, the road lost money and became a burden on the whole State, the people would insist upon the abandonment of the experiment, just as they have done elsewhere and heretofore. If the road paid, the private roads would be forced to adopt its system. The people would say to the private corporations, "You see what the State road is doing. It gives cheaper transportation and better accommodations than you, and yet it pays both interest and dividends; why cannot you do the same? You have always asserted that the government could not compete with private enterprise. How do you account for the facts? This won't do! You must adopt a system as liberal to us as that of the State road is to its people, or we will assume your roads, too." And the private corporations would speedily experience light. In the one case the people would refuse to be taxed to make good the losses of the State corporation; in the other case they would refuse to pay to keep up the extortions of the private corporations. Either way the phantom of ruin would vanish into air.

THE EXPERIENCE OF BELGIUM.

But it will be said, "This is all theory—very pretty, no doubt—but pure theory, and like most theories not well calculated for rough use." Very good—so be it! but we wish our case to be armed on every side, and so we will now abandon theory, and have recourse to precedent. Here is a little volume of about the size of a Webster's Dictionary, unabridged, which has recently been published, by order of the English Parliament. I do not propose to read it through to the committee—I have read it through myself, and I would not visit a similar infliction upon any other man except as a punishment for crime. As is the case with most legislative documents, its dullness is intolerable. This volume contains a very full report of the evidence submitted to a joint committee of Parliament, to which was referred a year ago the whole subject of the consolidation of railways in Great Britain. To procure official and reliable information the English Board of Trade sent their assistant secretary to the continent to report on the railway systems of other countries. That gentleman submitted the very thorough results of his inquiry to the committee in a document included in that volume, and stamped throughout with that peculiarly unimpassioned, business-like method of statement so characteristic of English official reports. He confines himself to facts and leaves inferences to others. After giving a sketch of the history of the Belgian railroad system (a small portion of which is reproduced in a popular form in the Railroad Commissioners' report for this session), he concludes with this extract, which reads as if it were written to bear upon this discussion:

"It is clear that in Belgium competition is most effectually killed, and yet at the same time that the difficult questions of special contracts, through rates, traffic arrangements and running powers have been solved, while the service is performed at rates which are satisfactory, at all events, to the public.

"That this has been the result of the action of the Government there can, I think, be little doubt, though circumstances in some degree fortuitous have helped to set the Government in motion.

"The State, acting as an independent company, has been able to make bold experiments, and by the mere force of its example to coerce the private lines into following its lead; at the same time there is at least room for doubt, whether if it had not been for the pressure of competition from lines running in and out of its own system, the State would have been so active.

"The measures of the State has been most vehemently criticised on the part of the companies, who have complained that their property was being unjustly depreciated by the lowering of tariffs made without sufficient cause and upon unsound principles, and which from their position they were in whole or in part compelled to adopt. * * * The State having this power, having the public purse to back it, being supported by public opinion, and having a dominant position from being owner of the best, or nearly all the best lines, had no need of any further power to control the private companies when once it began to act in earnest, and hence the State, though always acting on a footing of equality in matters of rates, facilities or purchase, has been able to lead or drive the companies to adopt its principles without putting in force parliamentary powers, or having recourse to anything but the moral influence of its position. * * * For in spite of the hostility and criticism of its opponents, the State has been able to carry through its measures, and has made a fair financial success, inasmuch as the present year will probably show a net return of six per cent. upon the invested capital."*

THE RESULT.

That covers every position I have taken to-day. Covers

*Report of Joint Select Committee on Railway Amalgamation; appendix I. p. 794.

them, not as the theories of a *doctrinaire*, but as the experience of the life of a railroad system. And mark the result, I pray you! The questions which perplex and agitate this people are settled in Belgium, settled on terms "satisfactory to the public." And this has been done through competition and without recourse to that legislative action which has failed so ignominously in this country and in Great Britain. And has this policy resulted in ruin? Not to any alarming extent. The net return upon the invested capital of State roads of Belgium in 1872 is stated at six per cent., and that on our Massachusetts roads, during the same year, was six and three-tenths per cent. But in Belgium money rules at perhaps four per cent. per annum, and with us during the last year it has averaged at least eight. An interest of six per cent. in Belgium is somewhat the same as an interest of twelve per cent here. It is not too much to say that in 1872 the State railroads of Belgium returned to those who owned them a profit fifty per cent greater, in proportion to the cost of money, than did the private roads of Massachusetts. This does not look like ruin to the private corporations. That talk has stopped in Belgium.

THE FAILURE OF OTHER STATE ROADS.

But there is one more argument against State ownership; an argument which I see by the papers was pressed upon your attention yesterday afternoon by an eminent gentleman, with whom it gives me satisfaction to say I I have had many pleasant relations—Mr. James F. Joy, of Detroit. He told you that this experiment of State ownership and management had been tried and failed repeatedly. He should, however, have gone one step further, and should also have shown you that private ownership had never failed; that we had never heard of railroad manias and panics, and that '57 was only a horrid dream. It is true that the experiments at State ownership attempted thirty years ago, when no one knew anything about railroad economy, failed; and they had companions in misfortune, for all the railroads in the country failed too. The simple difference was that the States could afford to throw their railroads over, and did; and the private parties couldn't afford to do so, and had to carry them through. Mr. Joy told you that the Michigan Central Railroad in the hands of the State lost money, but, when a private corporation took it, it paid large dividends. Very likely. The State, during a time of crisis, at the very ebb of the tide, threw away its property, and then the flood came and swept that road and every other on to fortune. It is notorious that there is hardly a railroad in Illinois—the great railroad State—which has not passed through bankruptcy in private hands. It is not fair to turn back thirty years to a time when everything failed, and the whole system, public and private, broke down, and say that then the State railroads broke down. So they did; and the States broke down too. Most of the readers of Sydney Smith have heard something of Pennsylvania bonds. Those who argue in this way should go on and prove to us that, while the government system broke down, the private system stood up. Unfortunately it failed to do it.

GENERAL CONSIDERATIONS.

But leaving these general arguments, upon which I have felt constrained to dwell so long, let me now press upon you certain general considerations in favor of the State now trying this experiment. The Commonwealth already owns a large portion of this line. We do not want to abandon what has cost us millions of money. Neither do the corporations, so ably and numerously represented here, seem fully able to agree as to which of them shall relieve the State of this heavy burden. Meanwhile the attempt at the regulation of railroads by statute has not proved a success, nor does it meet the approval of railroad men—they like it no better than State management. Like other eminent gentlemen in our recent history, they "want to be let alone." Well, if they cannot agree as to the disposition to be made of the road the State has built, and cannot operate their own roads so as to meet the popular expectation, is it not reasonable that the people should try at their own cost to see if they cannot themselves do better? A man can at least do whathe likes with his own, and buy in open market. Then if this experiment fails, one more stumbling block would be taken out of the discussion. It will be proved that the opponents of State ownership were right, and that its advocates were wrong. The property can then be disposed of to private parties, and we can address ourselves anew to some other solution of this difficult problem. For, gentlemen, rest assured that this prob'em has got to be solved. Do what you will and say what you will, railroads are not subject to the free action of the laws of political economy—and cannot be abandoned to them. Your patchwork legislation already hangs in tatters about the limbs of this giant, and with it you may cover him up, but you cannot bind him. Some other remedy has yet to be devised. That this which we now advocate is the final remedy is more than we dare assert. It has, however, proved an effective remedy elsewhere; and if you now try it and it fails, it is but one more piece of rubbish swept out of your path.

And now, gentlemen, I have come to a point in this discussion at which I propose to leave the path in which I have hitherto trod. For I believe I have said nothing to-day, at least, I was so instructed, and have tried to say nothing, which I have not substantiated by our own experience or that of other countries, or else by such a return to first principles and citation of authorities as should entitle it to, at least, a respectful consideration. I now propose, however, to indulge in a little theorizing of my own.

THE ARGUMENT REVIEWED.

But before doing this, I must ask you to bear with me, while I briefly review the ground over which we have advanced, and the conclusions I have sought to establish. I think they are not illogical. In the first place, through argument, universal and long-established usage, and general authority, I endeavored to show that the system of transportation by rail was not subject to those fundamental laws upon which what is known as the science of political economy is based; that, indeed, it holds a position as regards the community in no respect the same as that of ordinary industrial pursuits. This position established, and the railroad system put upon the footing of a practical monopoly, it followed that some machinery for its regulation through the agency of government must be devised. That by statute or the exercise of legislative power was the most obvious. This we have attempted to show, both through careful historical investigation and by abstract argument, was at once ineffective, and, in its political aspect, peculiarly corrupting and dangerous. If I did not wholly fail in this attempt, it followed that some new method of regulation must be devised. Looking abroad, that we might tread in a beaten path, I then had recourse to the experiment of foreign countries. Our aim was to get back, if in any way we might, to the firm ground of fundamental principle—we looked to set our feet in the tracks of our fathers, in which we could neither stumble nor fall. If our government must regulate, must meddle, how could it do so with the least degree of danger to itself and to the interests involved? Under the happiest auspices we realized that dangers enough gathered about the path.

The answer was, through the artificial establishment of that principle of competition which, in the matter of transportation by rail, did not naturally exist. This had elsewhere been secured through a mixed ownership, under which public railroads and private railroads were kept in constant opposition. But this implied the fact of State ownership—a most dangerous political innovation. If, however, such an innovation was necessary, though it was to be entered upon with doubt and reluctance, yet precedents for it were not wanting. They were found in our postal and educational systems, in our hospitals and our water supply. If, then, in this case, the Government must intervene, could it not most safely and effectively intervene by going into the railroad business as it had already gone into the postal, the medical, the educational and the water business? It remained to consider what was the least degree into which it could enter it, and yet secure the end it had in view; for be it always remembered, we insist that Government would not be justified in entering into any business simply to make money, but only to protect the public against the control of a monopoly. Conceding therefore, for the purposes of argument, the principle of mixed ownership, those opposed to us have a fair right to ask of us to define what we mean when we thus speak of a "least possible amount." They may well say, "You have no right while discussing such a subject as this to stand up and talk of 'least possible amounts.' Define yourselves. Give us some idea of what is implied in this unknown quantity."

THE FUTURE OF OUR RAILROADS.

That I may do this, gentlemen, it is necessary for me to ask you to form some definite conception as to the probable future of the railroad system of Massachusetts. You are sitting here to pass upon a question in regard to which your decision is destined to be productive of very great results for good or evil to the Commonwealth. You have, therefore, no right to report a measure without forecasting the future to the best of your ability. To look far behind the vail is not given to mortal eyes; but, so far as we may, we are in duty bound to look before we finally pass upon such a measure as this. For myself, knowing as I do the principles which are controlling the development of railroads, both in this country and in Europe—as the result of the best study which with my poor ability I can give to this subject, and which certainly has not lacked the quality of assiduity—I am prepared to see great changes in the immediate future. As respects the principle of consolidation, I am ready to go very far. It is a necessity—a natural law of growth. You may not like it; you will have to reconcile yourselves to it. You may try to check it, and by so doing force it into unnatural shapes, but you cannot stop it Others, stronger than you, have thought to do so, and their attempts have but resulted in failures, as will be the case with yours, should you vainly follow in their steps. The railroad system will grow—it must grow—and its development must take the form of a larger consolidated ownership. The day of small corporations, operating forty or fifty miles of road, is past. They cannot control the capital, they cannot command the business capacity necessary to meet the vast and increasing requirements of the present day. Whether in some respects they are an evil or no, consolidated railroad lines are no less inevitable than necessary, and the immediate question now before you involves in its correct solution some definite ideas as to what effect the course of consolidation is to have on the railroads of this State.

SIX RAILROAD FAMILIES.

I, myself, look forward with confidence to the time as not remote when some six corporations will in fact control the railroad system of Massachusetts. France, with twenty-five times our territorial area, is already districted out among an equal number. Our railroads, under the pressure of natural laws, will thus gravitate into families of somewhat the following description: to the North and East, the Boston & Maine and the Eastern, with their connections, will form one family. If they had formed it two years ago it would have prevented the wanton throwing away and the wicked waste of millions of money. Next to this and stretching its arms out to Ontario, Canada, and the whole undeveloped North, will be the Boston & Lowell—the great northern consolidation for which your laws already provide—a field large enough to fill the ambition of any common man. Then should come the Fitchburg Railroad and its connections, binding the State by its all-rail route to the great lakes and the West, and reaching into the coal fields of Pennsylvania. Further south will be the Boston and Albany family, operating a powerful line already well consolidated and well understood. Beyond that will come the Boston, Providence and New York family, to constitute which the Boston & Providence and the Boston, Hartford & Erie lines must ultimately absorb each other—though the time is not yet. And this connection will take to itself the territory of southwestern New England and will stretch across the Hudson to the coal fields again, and on over the Erie and the Pennsylvania to the West. And finally to the Southeast, now the most firmly consolidated of all, occupying the remaining sections of the State by a responsible tenure which cannot be shaken, and to the great benefit of the people thereof—in that direction we find the family of the Old Colony.

CONSOLIDATION NECESSARY AND BENEFICIAL.

Unless my foresight wholly fails me, I have now roughly indicated the general outline of our railroad consolidations; and, so far as I am concerned, representing in some degree the Commonwealth in dealing with its railroads, I would much rather have to do with these six families than with an awkward congeries of disconnected quarreling fractions of a system, such as now exists. Take any one of these roads and you could deal with it in some position of equality. It could be held to some degree of responsibility, and upon any abuse connected with its management we might hope to concentrate and direct the force of public opinion. A group of small corporations, on the contrary, is always irresponsible, and to argue with them is like spending one's breath in a talk with the north wind. They cannot understand you in the first place; and, in the second, they could not do what you want if they did. They cannot afford to secure the services of those able men who alone can grasp the significance and possibilities of the railroad system; and they could not carry out their plans if they did. If you want to put brains and money into your railroad system, if you want corporations which you can hold to some degree of responsibility, then you must let development take its natural course, and you must not seek to keep the man swathed in the swaddling clothes of the babe.

THE STATE SHOULD OWN ONE FAMILY OF ROADS.

But if this is to be the form which the railroad system is to assume, if consolidation is thus inevitably reducing the small number of competing points, why is not your system at last a naked, recognized monopoly? The phantom of competition haunts it no more. Then you must regulate or you must submit; there is the alternative. Now if this is the result to which the railroad system of Massachusetts is tending, and you would seek to regulate through mixed ownership and competition rather than through legislation and meddling, what is the least possible ownership among six such families as I have described which would enable the State through the management of a part to regulate the whole? Clearly, we say, it is to own one of these family groups out of the six, and then mere common sense points out the Fitchburg and tunnel family as the one. Why, gentlemen, see the position which this line occupies, and the controlling power which the possession of it would put into the hands of the State. Through the Cheshire road it connects with Canada on the north, competing with the Northern line. It runs parallel with the Boston & Albany, and where that goes it can go. Through the channels of the Delaware & Hudson Canal Company it reaches into Pennsylvania, and competes with the Hartford & Erie, and with the very colliers which come to us by sea. The trade of Connecticut and New York city is the only trade it cannot touch, and that is competed for by water. He who holds the tunnel line holds, therefore, the key of the railroad system of Massachusetts; he holds the key, but there is but one holder who would use it.

So much for our external traffic; but this does not cover the case of local traffic. It is, however, impossible that there should be two different systems of local transportation in any community, the one being right and the other wrong. A successful innovation will soon force its way into general use. But to remove an abuse or to explode a false theory, you must demonstrate the existence of your abuse or the falsity of the theory. Here the railroad corporations have us on the hip. We may talk, argue and discuss; we cannot demonstrate. With the State operating the tunnel line there would not be a form of transportation by rail from without or within the Commonwealth, no matter how removed from immediate contact with the State road, which would not feel instantly the effect of any reform in management established upon it. I have shown you that in practice this was found to be the case, through the long experience of Belgium, and it would have to be the case here. If, on the contrary, no reforms could be introduced successfully on the State road, then the case of the private corporations would be made out. What the people could not accomplish on their own road, they could not ask or expect to see accomplished on the roads of others.

THE LIMITS OF THE EXPERIMENT.

Here then is where we would limit the experiment of State ownership. To go beyond this and to talk of assuming all the railroads in the State, or even the greater part of them, would not only expose our political system to a great and unnecessary danger, but it would destroy the very essence of the experiment, the mainspring of success. We rely on competition to preserve us from red tape on the one side, and corruption on the other, and so we do not want to destroy competition by State ownership, but we want to get back to it through mixed ownership. When we stand upon competition we feel the solid ground under our feet. That solid ground, so far as Massachusetts is concerned, we believe could be secured through the public ownership and management of the one railroad line which will owe its existence to the State, and which stretches its sinews and feelers throughout the railroad system of the State.

CONCLUSION.

In respectful compliance with the request of the committee, I have now submitted the views of the gentlemen composing the Railroad Commission on the matter before you. We consider this no case for dogmatism or angry discussion. We are too well acquainted with the magnitude and many-sidedness of this railroad problem to profess an implicit faith in any solution of it we may have to propose. Meanwhile I have freely submitted to you, in this public way, my colleagues' and my own contribution to this debate; and, having done so, I will add that, in accordance with the invariable rule of our board, unless officially called upon by you, we shall in no way seek to further influence the course of legislation.